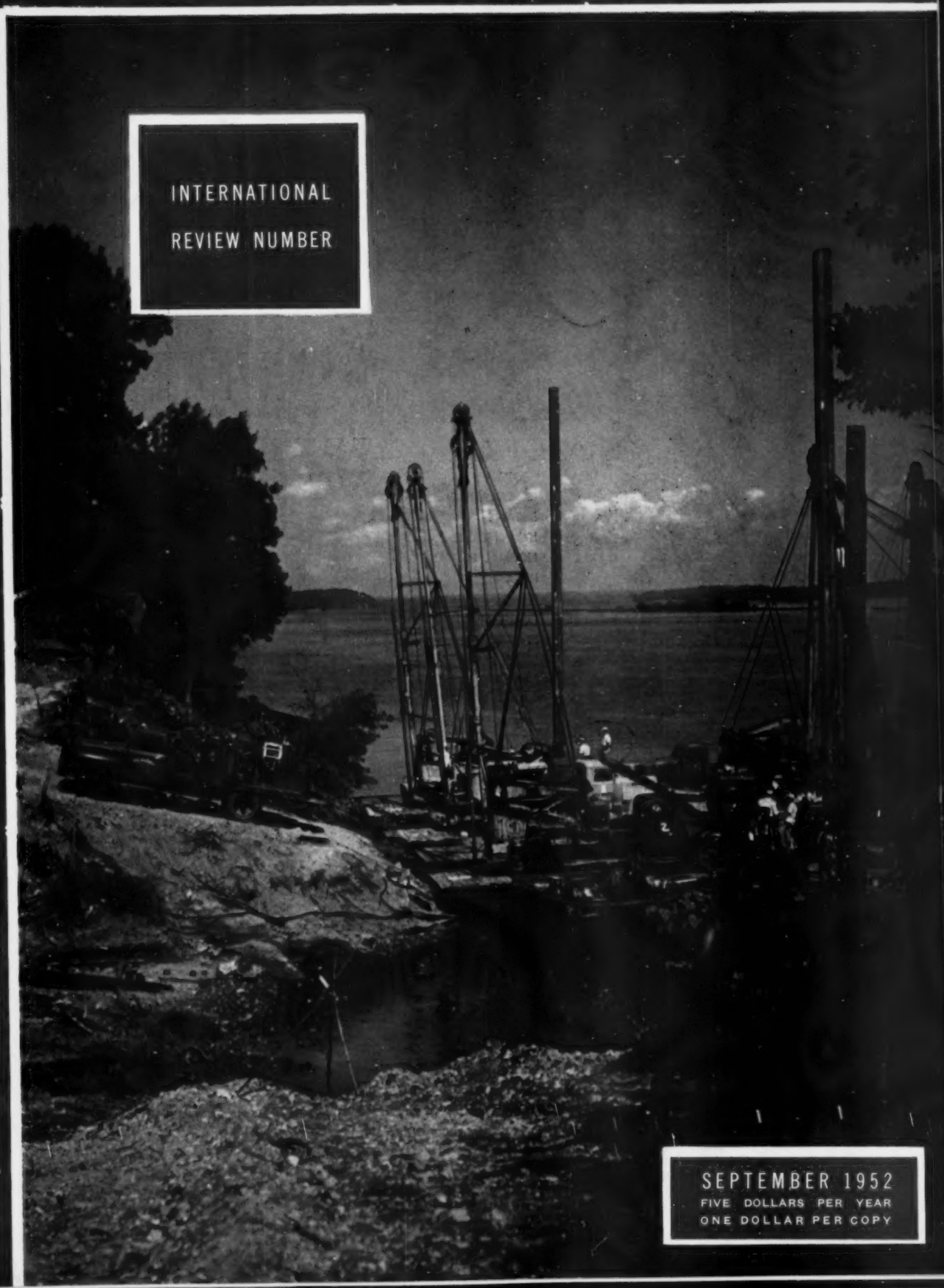
World Petroleum



INTERNATIONAL
REVIEW NUMBER

SEPTEMBER 1952
FIVE DOLLARS PER YEAR
ONE DOLLAR PER COPY

WHEN WINTER COMES...

NATURAL GASOLINE
PROPANE
ISO-BUTANE
BUTANE
ISO-PENTANE
NORMAL PENTANE
HEXANE
HEPTANE
HEAVY NAPHTHA
STA-VOL-ENE

WILL YOU HAVE ENOUGH VOLATILITY?

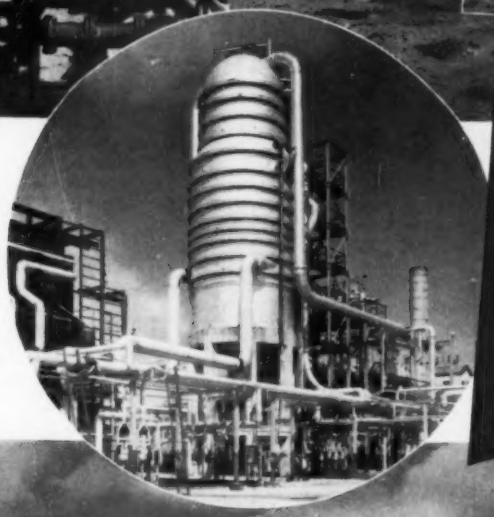
WARREN

PETROLEUM CORPORATION

TULSA, OKLAHOMA CABLE ADDRESSES: Stavolene, Warren

EXPORT TERMINALS: CORPUS CHRISTI, PORT ARTHUR, BAYTOWN, TEXAS CITY AND WARRENGAS, HOUSTON, TEXAS

CHICAGO BRIDGE & IRON COMPANY

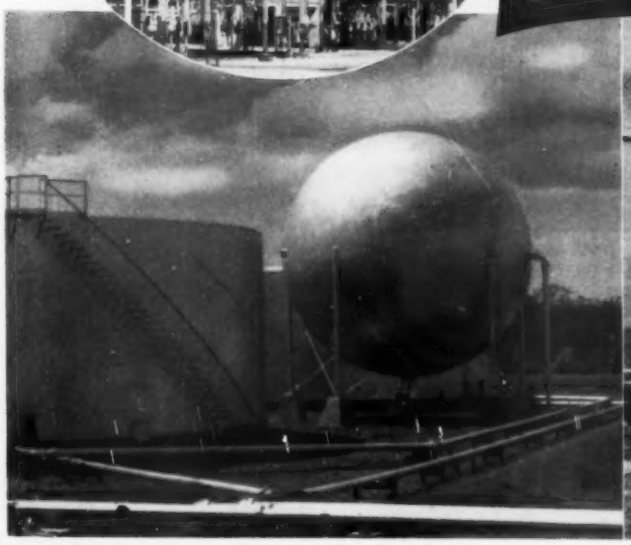


HORTON TANKS

Serve The Petroleum Industry All Over The World

Modern petroleum refineries, pipelines and terminals throughout the world install Horton tanks and steel plate equipment to store and handle petroleum products economically and efficiently.

Whether you operate a pipe line terminal, refinery, or a gas processing plant, investigate the advantages of Horton equipment when you require new facilities. Chicago Bridge has offices in principal U. S. cities and licensees in several European countries.



FOR TENNESSEE GAS TRANSMISSION COMPANY

MORE COMPRESSOR STATION FACILITIES BY GRAVER CONSTRUCTION CO.

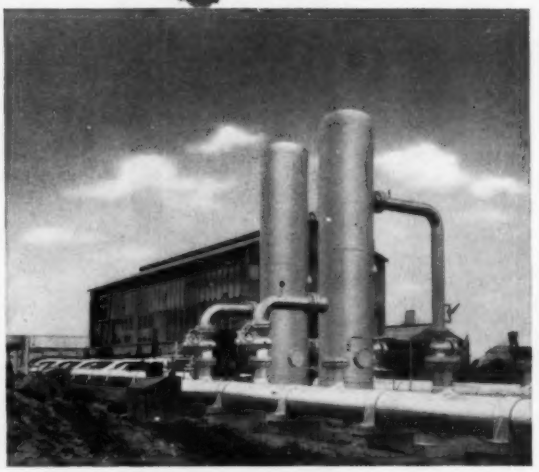
As part of a program to enlarge its existing natural gas pipe line facilities and to extend the system to serve the Northeastern United States, the Tennessee Gas Transmission Company last year constructed 836 miles of main pipe line and three new compressor stations.

One of the most significant of these stations was constructed at Hamburg, N. Y. and formed the initial point in the line running eastward across New York to bring natural gas service for the first time to the New England area.

The Graver Construction Co. built the Hamburg station.

As part of a program to increase further its existing natural gas pipe line facilities during 1952, TGT is constructing 525 miles of new line, building four new compressor stations, and enlarging many existing compressor stations to increase horsepower by about 90,000.

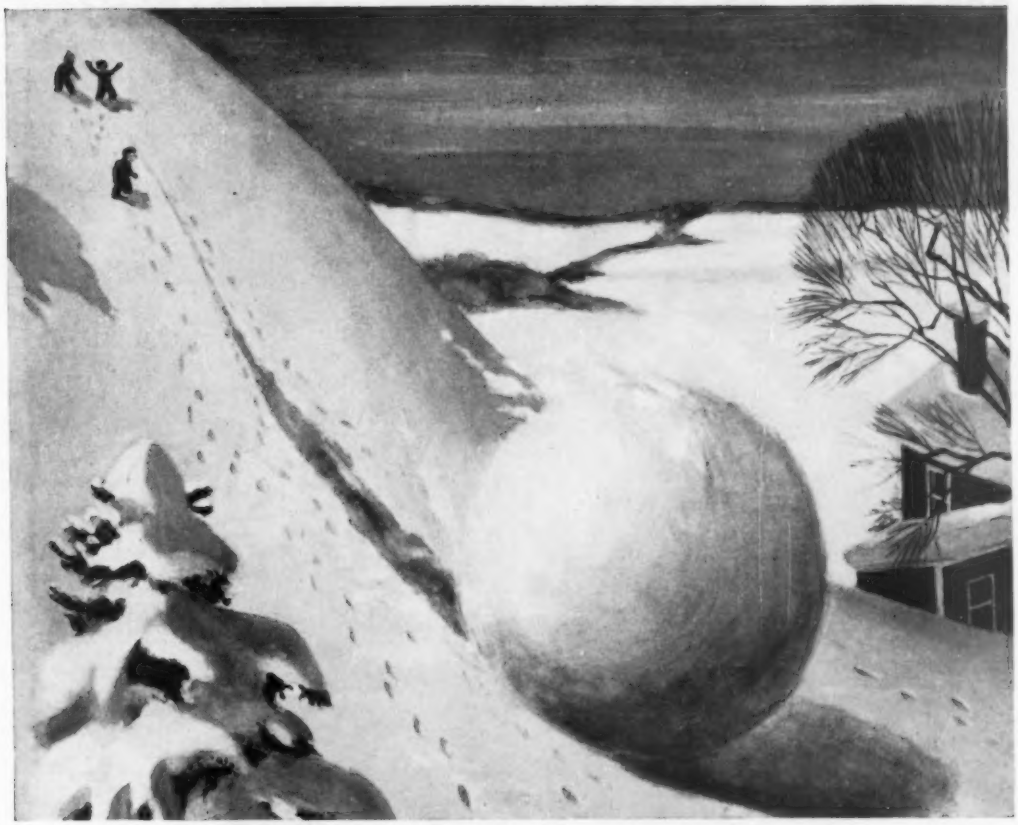
The Graver Construction Co. is enlarging three of these stations — Agua Dulce and Jasper, Texas, and Batesville, Miss.; and is building a new station at Nassau, N. Y.



Compressor Station, Hamburg, N. Y., built by Graver

GRAVER CONSTRUCTION CO.
332 S. MICHIGAN AVENUE CHICAGO 4, ILLINOIS • NEW YORK • HOUSTON
A Division of
GRAVER TANK & MFG. CO., INC.
East Chicago, Indiana

WORLD PETROLEUM for September, 1952. Vol. 23, No. 10, September, 1952. WORLD PETROLEUM is published monthly by Mona Palmer, Trustee under the will of Russell Palmer, 2 West 45th St., New York 36, N. Y. Acceptance at East Stroudsburg, Pa., under Section 34.64 P. L. & R. Authorized. Subscription rate: $5.00 per year, single copies $1.00 Copyright, 1952, by Mona Palmer, Trustee.



Good ideas are like snowballs

When you start one rolling, there's no telling how far it will go or how big it will grow.

For example, several years ago we received a letter from an oil marketer in Michigan, enclosing an invoice for some gasoline he had purchased back in the 1920's. He noted that the current price of gasoline, excluding taxes, was no higher than a quarter century ago, and he wondered how the actual *value* of the gasoline compared with that of 1925.

We knew there was a good idea here, and so we decided to do some research on the subject. It sounded like an easy question to answer, but we soon discovered it wasn't. We had to trace the separate contributions of the oil and automotive industries through the years. We had to develop a continuous record of octane numbers, as measured by today's scale, and we had to determine the road performance of these gasolines in contemporary cars of the various years.

Finally our study was completed. We were able to report back to the Michigan oil marketer that, by any real standard, the value of gasoline had increased approximately 50% in the last quarter century. In other words, *two gallons of today's gasoline will do the work that required three gallons in 1925!*

This was news! Here, in one short sentence, was the whole story of the tremendous job American petroleum refiners had done for the public in the past twenty-seven years! It was a record to be proud of. So we took the "2-3" story to the country in public demonstrations in Detroit; Washington, D.C.; Newark, N. J., Los Angeles; and Chicago. Newspapers across the country picked up the story. Magazines ran feature articles about it.

And the idea is still snowballing! This year, the OIIC is using the "2-3" idea as its theme for Oil Progress Week.

ETHYL CORPORATION, New York 17, New York

OIL AT WORK—*halfway 'round the World*

Quality fuels and lubricants help produce more food—faster

THE WELFARE, economy and security of a nation stem from the land. Mechanized farming reduces man-hours of labor, steps up the vital supply of food, speeds it to market. This evolution in agriculture has been assisted by petroleum. And – in many lands throughout the Eastern Hemisphere *Caltex* quality fuels and lubricants are contributing to their healthy growth through more adequate food production.

CALTEX
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Europe...Africa...
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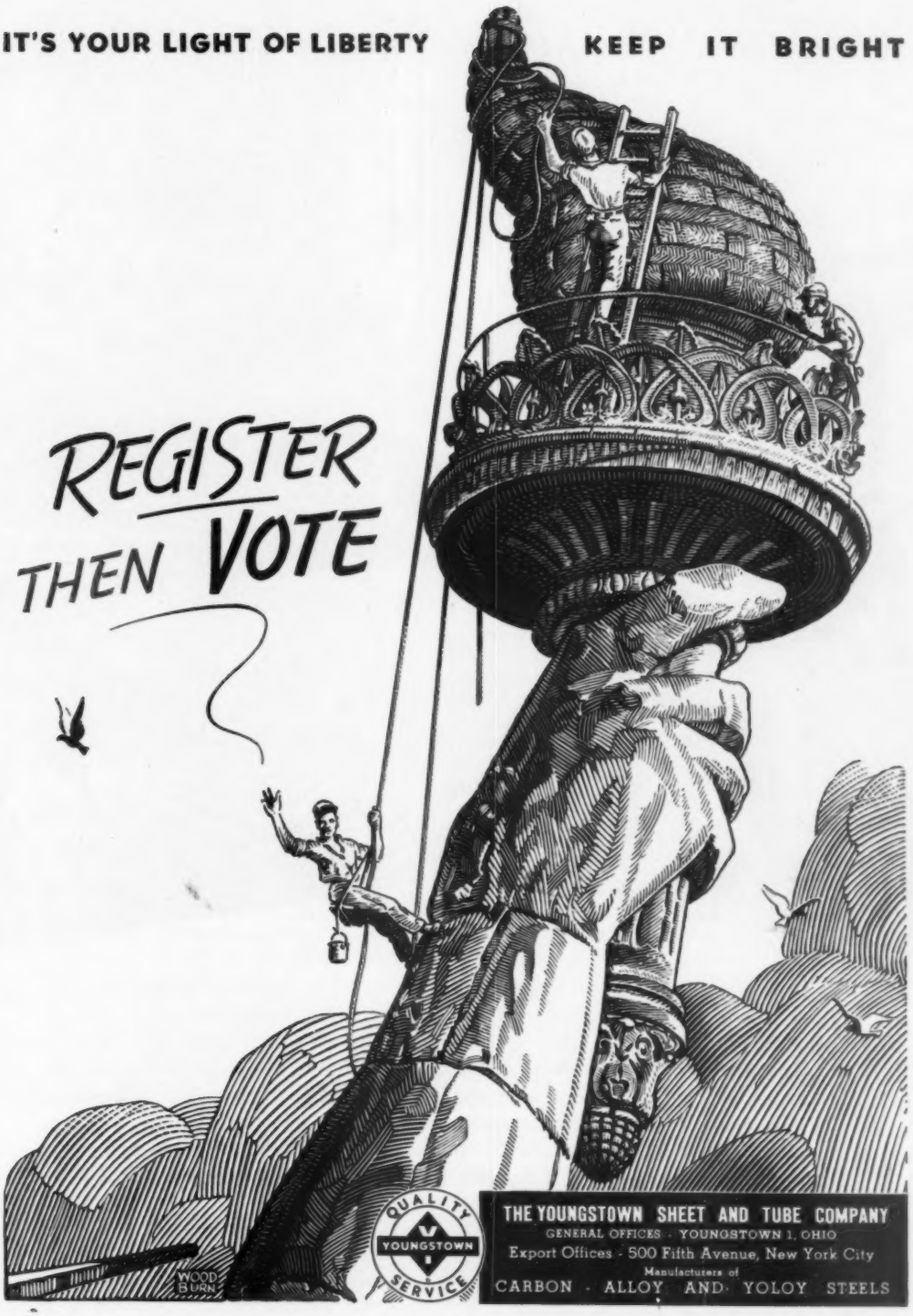
CALTEX PETROLEUM PRODUCTS

IT'S YOUR LIGHT OF LIBERTY KEEP IT BRIGHT



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GENERAL OFFICES · YOUNGSTOWN 1, OHIO
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CARBON · ALLOY AND YOLOY STEELS

Keep in touch by

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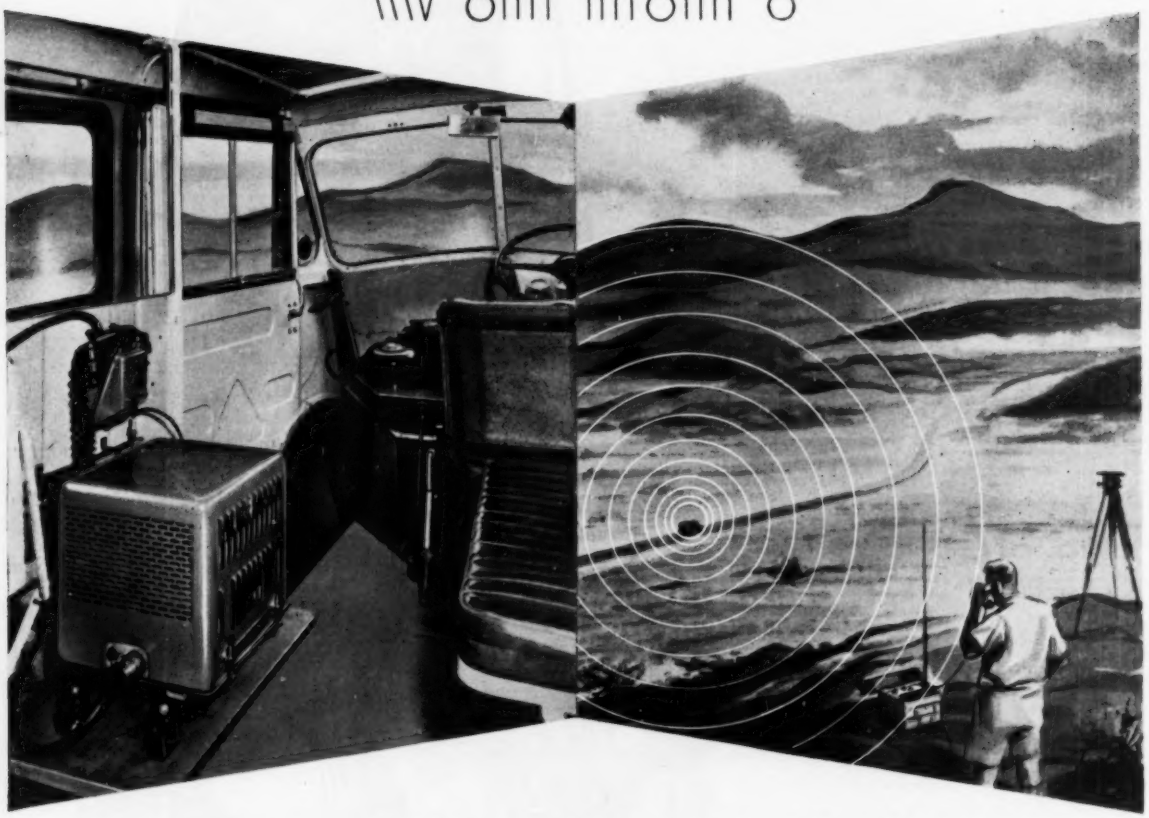


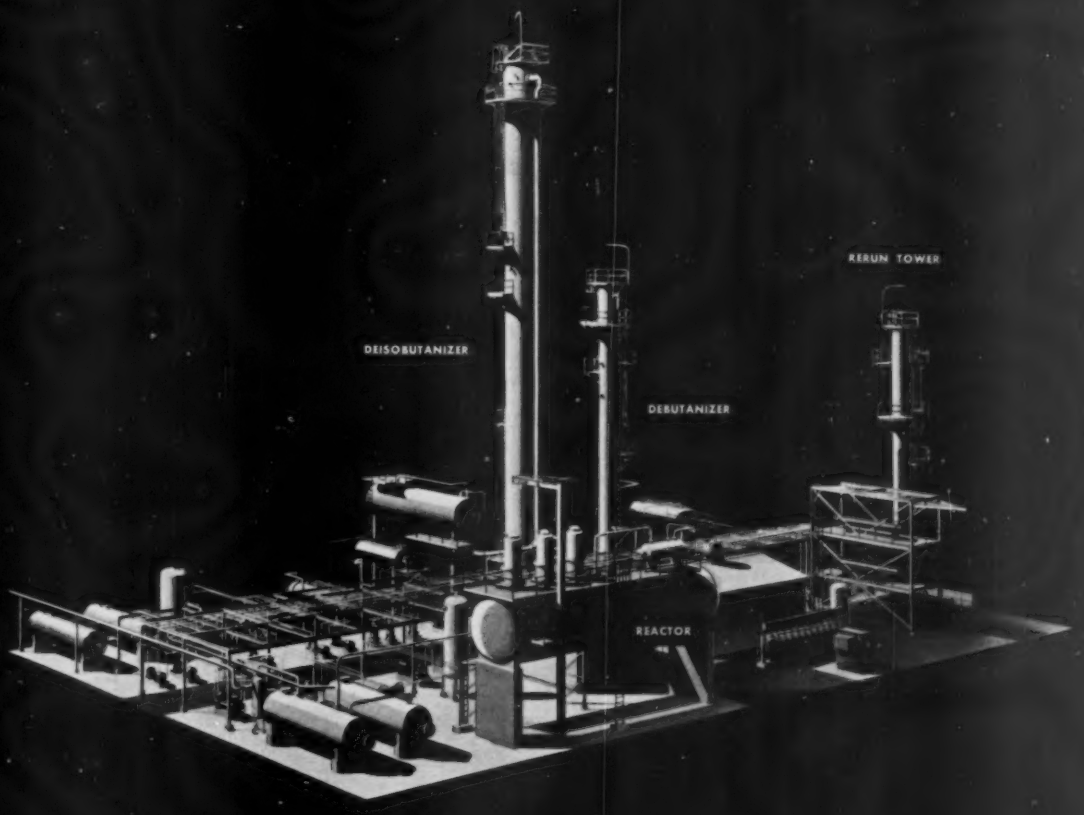
Once your transport has left base it need never be out of touch if type P.M. radio equipment is installed. Of exceptional rugged construction this set has been designed to withstand and will take the rough treatment to be expected from bad or non-existent road surfaces. An operating range of over 20 miles is obtainable between two P.M. sets, one mounted in the vehicle and one located at base. The equipment may be mains or battery driven and is arranged for remote operation from a telephone type unit. It is suitable for breakdown vehicles, safari trucks and for geological and survey work. A portable (20 lb.) set is also available for working either to base or to the mobile station.

AUTOMATIC TELEPHONE & ELECTRIC CO. LTD.

RADIO AND TRANSMISSION DIVISION, STROWGER HOUSE, ARUNDEL STREET, LONDON, W.C.2.

Telephone: TEMple Bar 9262 *Cablegrams:* Strowgerex, London.

AT 14231—8X107



catalytic alkylation

Embodying all the latest process design improvements in Sulfuric Acid Alkylation, the unit illustrated above—soon to go "on stream"—is one of 14 Alkylation units with a combined output of 35,000 barrels of Alkylate per day, designed and constructed by Foster Wheeler for the worldwide petroleum industry.

FOSTER WHEELER CORPORATION

165 BROADWAY, NEW YORK 6, NEW YORK

In Toughest Oil Field Service . . .

WHITES are Extra Rugged Extra Dependable

IT'S MORE than a matter of low operating cost with these rugged and ready Whites for oil field service.

True, Whites have an amazing record in the petroleum industry around the world, for low maintenance cost, fuel economy and long life.

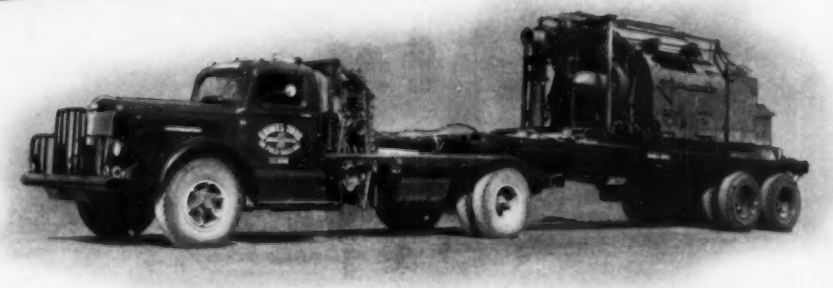
But it's more than that! It's that *extra* performance in the toughest kind of service . . . year after year . . . that comes only from *extra* quality engineered to your *exact* requirements.

Gasoline and Diesel-Powered Whites are built for the tough, heavy hauling jobs . . . built for long life . . . built to oil field specifications. More stamina—more pulling power!

Your nearest White Representative will provide facts about White Trucks for your operations.

This White Model WC2864 WD has 212 in. wheelbase. It's moving complete substructure of drilling rig in Glenrock oilfield, Wyoming. Net payload weight is 125,000 lbs.

This oil field "big job" is a White Model WB28 which has been in steady oil field service for nearly five years . . . hauling payloads that weigh "into the millions" during its service in Texas oil fields.



White

THE WHITE MOTOR COMPANY • Cleveland 1, Ohio

Export Department **Cables: Whitco**

THE WHITE MOTOR COMPANY OF CANADA LIMITED • FACTORY AT MONTREAL

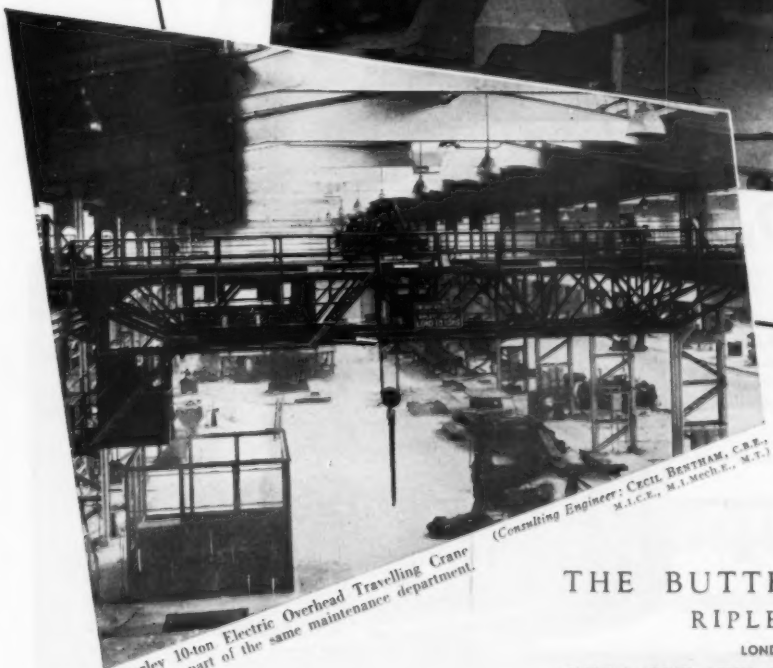
There is a complete line of White Trucks for the petroleum industry: White Super Power . . . White Diesel Power . . . and the White 3000 with the power-lift cab.

FOR MORE THAN 50 YEARS THE GREATEST NAME IN TRUCKS

ELECTRIC OVERHEAD TRAVELLING CRANES

by BUTTERLEY

30 ton Butterley Electric Overhead Travelling Crane recently installed in the maintenance department of an important steel works.



Butterley 10-ton Electric Overhead Travelling Crane in another part of the same maintenance department.

(Consulting Engineer: CECIL BENTHAM, C.B.E., M.I.C.E., M.I.Mech.E., M.I.)

THE BUTTERLEY COMPANY LIMITED

RIPLEY · DERBY · ENGLAND

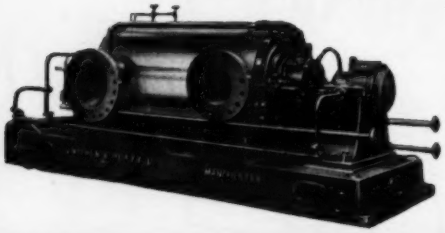
LONDON OFFICE: 20 ASHLEY PLACE • VICTORIA • S.W.1

OVERSEAS AGENTS: MESSRS. CECIL TRESS & CO. LTD., AFRICA HOUSE, KINGSWAY, LONDON, W.C.2

EC24b

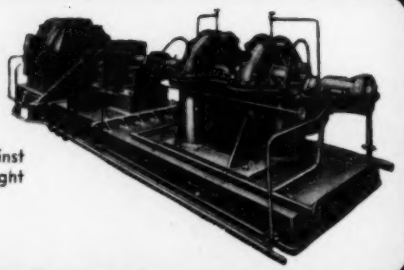
Centrifugal Pumps
& FLAMEPROOF MOTORS

Main Pipeline Pumps....



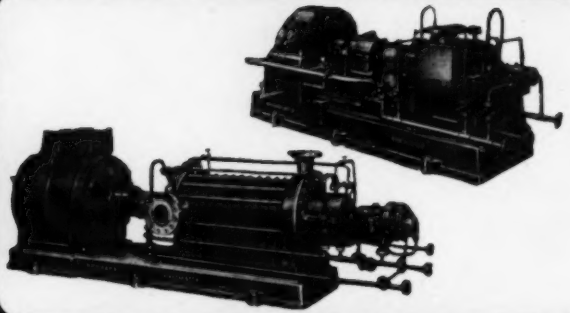
Mather & Platt multi-stage 'Plurovane' pumps were amongst the earliest centrifugal pumps installed for main line work. The pump shown on the left is a typical modern 'Plurovane' designed for a throughput of 50,000 bbls/day of crude oil against a pressure of 750 p.s.i. when running at 1500 r.p.m.

Transfer and Loading Pumps



Our standard ranges include a pump for nearly every transfer or loading duty. The two-stage "Medivane" pump illustrated on the right can handle 700 tons/hr. of crude or products against heads up to 500 ft. It is driven through a gas tight wallbox by a 550 h.p. Mather & Platt Motor.

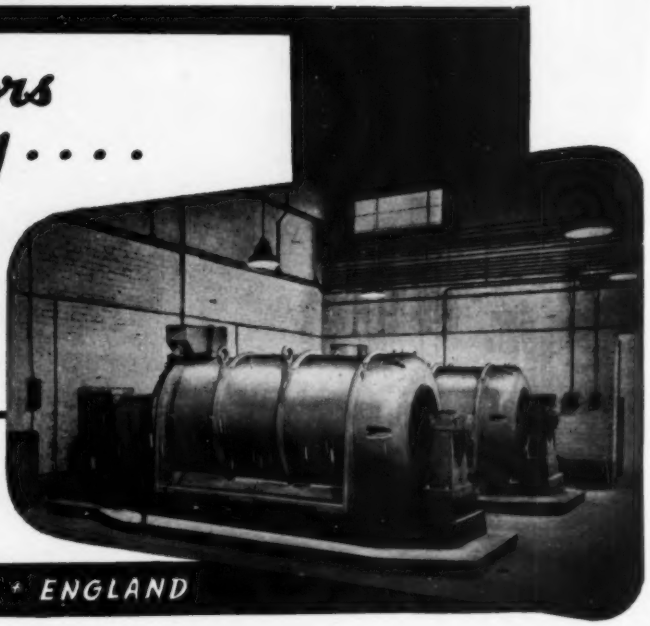
Refinery Process Pumps



Our long refinery experience at home and abroad enables us to supply pumps for the most arduous refinery duties. The illustration shows typical units:—a steam turbine driven pump handling oil at 500 degs. F. and a motor driven "Plurovane" pump dealing with light volatile hydrocarbons.

Flameproof Motors on Pipeline Duty....

Mather & Platt electrically-driven centrifugal pumps on an oil pipe line. The motors here illustrated are of the totally enclosed flameproof type, and are of 1,000 h.p. capacity, fed from a 3 phase 50 cycle 6000/6600 volt supply. They are squirrel cage direct-on started machines with a starting current of four times full load value.



MATHER & PLATT

LIMITED

PARK WORKS · MANCHESTER, 10 · ENGLAND

FOR MORE RAPID LAYING OF PIPELINE

The production and piping of oil has been said to depend upon compressed air more than any other single form of power. Compressed air from the first moment of site preparation . . . compressed air for trenching and rock drilling in the extension of the vital pipelines . . . compressed air for the multitudinous items of maintenance. In applications such as these, three factors must outweigh all others — outstanding reliability in compressors to ensure a continuous supply of air . . . the highest degree of efficiency in compressed air tools to ensure the economical use of that air . . . and a really extensive range of equipment to provide a tool for every purpose. Because CP meets these requirements in full measure, it certainly pays to . . .

CALL IN CONSOLIDATED

CONSOLIDATED PNEUMATIC TOOL CO. LTD. – LONDON & FRASERBURGH

Offices at Glasgow • Newcastle • Manchester • Birmingham • Leeds • Bridgend • Belfast • Dublin • Johannesburg
Bombay • Melbourne • Paris • Rotterdam • Brussels • Milan • and principal cities throughout the world.

Cut Time Lost

on Oil Well Pumping Service

New G-E Motor Control is *LIGHTNING TESTED!*

Better Motor Protection! New G-E oil-well pumping control (outer and inner doors open, timer cover removed) gives short-circuit, overload and undervoltage protection. Sequence timer and third overload relay can be added if desired.

Now you can reduce time lost on inoperative oil-well pumping service due to lightning surges! This new G-E motor control is *lightning tested!* At G-E lightning laboratories, G-E motor control withstood lightning surges of 22 kv crest—far above average oil-field crests—*without one failure!*

NEW DESIGN!

Thyrite® meter protector—co-ordinated with control—is connected *ahead* of fuses, prevents high surge currents from reaching fuses. Improved magnet coil-winding technique helps it stand surges even more efficiently.

EASIER TO INSTALL, OPERATE, MAINTAIN!

40% smaller, much lighter . . . automatic program-timing relay, 3-position selector switch, front-connected wiring, optional sequence-restarting device. Resists moisture and corrosion with new magnetic starter, "strongbox" plastic-encased magnet coil.

Learn how new G-E *lightning tested* motor control—NEMA sizes 1 to 3 for squirrel-cage motors up to 50 hp—gives your pumping new dependability. See your G-E representative. Or write for FREE bulletin GEC-720 to: International General Electric Co., Apparatus Dept., 570 Lexington Ave., New York 22, N. Y., U.S.A.

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BUILDING A GREATER AMERICA

Built at Sun Ship, on the Delaware, these dehydrating towers now serve Western homes and industries.

Across the wide Missouri

Pioneers in prairie schooners blazed a courageous trail "across the wide Missouri . . ." and across the entire continent . . . in their search for new opportunity.

The industrial services of modern America have followed in that trail. Thriving farms, towns and cities mark sites where pioneers found only hardship . . . because American industry is truly "All-American."

Today, *all* America shares the benefits of *all* of America's progress . . . because great companies develop and distribute the advantages latent in our natural resources . . . and because great industries like Sun Ship can build and deliver, anywhere in the world, the gigantic equipment needed to convert petroleum and various chemicals into light, heat, power and the other productive forces which serve mankind's comfort and progress.

Sun

SHIPBUILDING & DRY DOCK COMPANY

SINCE 1916

ON THE DELAWARE • CHESTER, PA.

25 BROADWAY • NEW YORK CITY

100 ton guy derrick crane

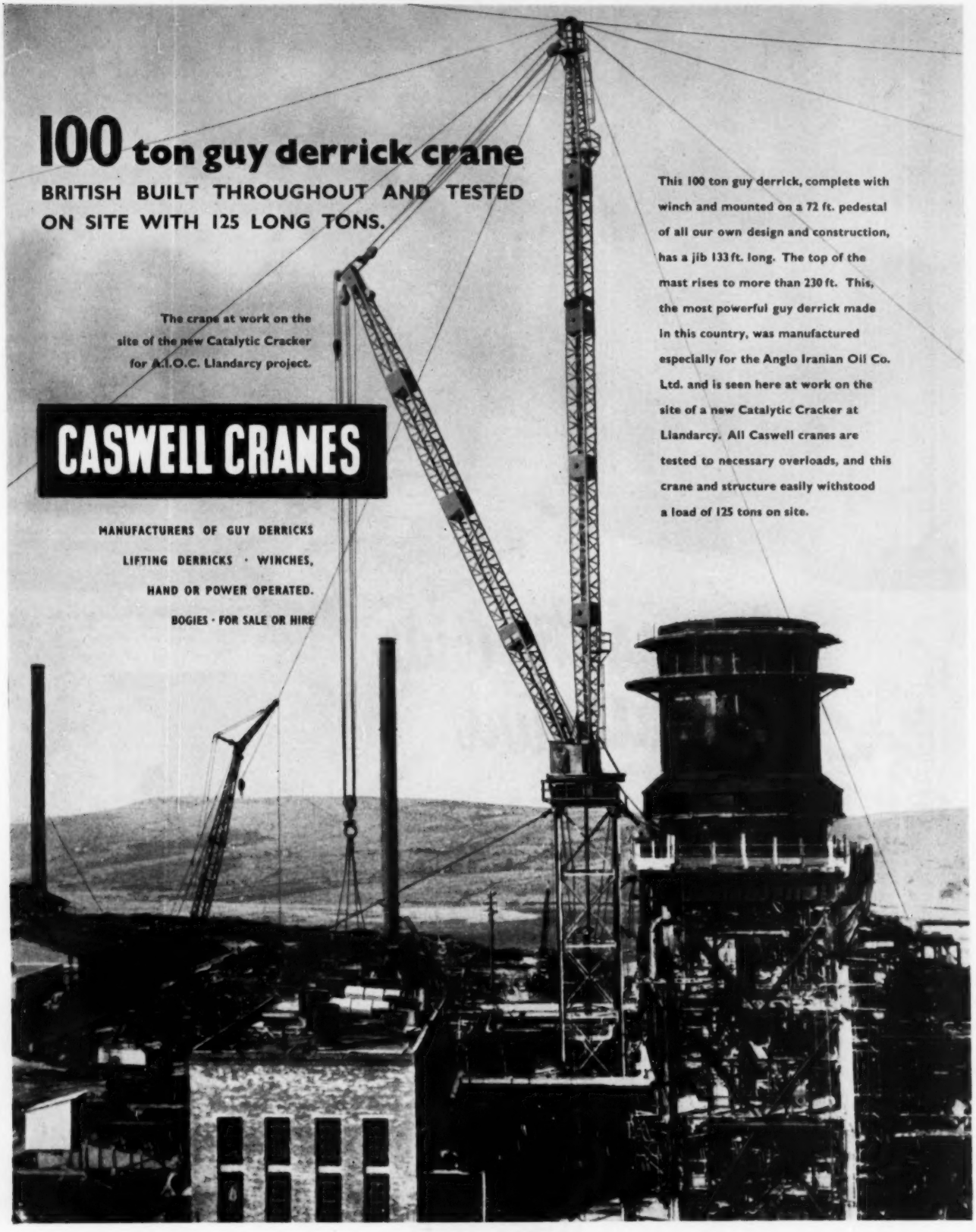
BRITISH BUILT THROUGHOUT AND TESTED ON SITE WITH 125 LONG TONS.

The crane at work on the site of the new Catalytic Cracker for A.I.O.C. Llandarcy project.

This 100 ton guy derrick, complete with winch and mounted on a 72 ft. pedestal of all our own design and construction, has a jib 133 ft. long. The top of the mast rises to more than 230 ft. This, the most powerful guy derrick made in this country, was manufactured especially for the Anglo Iranian Oil Co. Ltd. and is seen here at work on the site of a new Catalytic Cracker at Llandarcy. All Caswell cranes are tested to necessary overloads, and this crane and structure easily withstood a load of 125 tons on site.

CASWELL CRANES

MANUFACTURERS OF GUY DERRICKS
LIFTING DERRICKS · WINCHES,
HAND OR POWER OPERATED.
BOGIES · FOR SALE OR HIRE



CASWELL CRANES AND ERECTION LIMITED GROVE WORKS, HAMMERSMITH, LONDON, W.6. TELEPHONE RIVERSIDE 5203 AND 5204.

VERSATILITY PLUS!

AND THEN SOME...with the INTERNATIONAL TD-6 Diesel Crawler

Bucyrus-Erie bullgrader and International TD-6 tractor! That's a top team for grading.

Increased power has also increased the tremendous versatility of the International TD-6 crawler tractor. Light-treading, packed with performance—it delivers the most effective, most maneuverable 40 horsepower available today! Your International Industrial Power distributor has all the facts—get them from him now.

The sure-footed TD-6 handles a heavy-duty four-bottom plow with ease. Doesn't pack wet soil!

Snaking logs! Plenty of hefty pull for moving timber with a rear-mounted winch on the TD-6.

Willing worker for loading, clean-up work, grading and filling—a TD-6 and Bucyrus-Erie ¾ yd. dozer-shovel.

INTERNATIONAL HARVESTER EXPORT COMPANY

World-wide distributor of products manufactured by the International Harvester Company in the U.S.A. and by affiliated subsidiaries in Canada, the United Kingdom, France, Germany, Sweden, Mexico and Australia.

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INTERNATIONAL INDUSTRIAL POWER

CRAWLER TRACTORS
WHEEL TRACTORS
POWER UNITS

"Through the development of its resources society acquires skilled workers and technicians and a vast storehouse of knowledge with which to make further progress. Man's greatest resource is his own resourcefulness."

STANDARD OIL COMPANY
(NEW JERSEY)
AND AFFILIATED COMPANIES

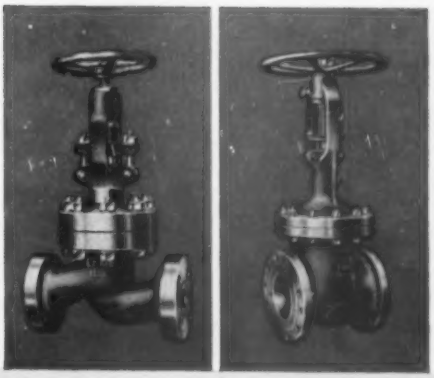
Valves

for the Petroleum Industry

In addition to Oilwell Derricks, Pipe Lines, and apparatus for Refinery Plants to DIN or ASA specifications, our production range covers Valves and Fittings suitable to meet any operating pressures and temperatures in accepted usage. Our KITO-Valves give excellent service in applications where a reliable, efficient protection against fire or explosions is essential for highly inflammable liquids and gases in storage tanks or in transit.

Subjected to severe tests on up-to-date testing stands with petroleum and hot steam up to 1800 lb/sq. in. and 1100° F, these valves ensure strictest compliance with the overriding principle:

Safety First



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Magcobar

IS ONE OF THE DRESSER INDUSTRIES

Magcobar's chemists and engineers are working steadily to develop new products to improve present drilling mud practices and to meet the needs of deeper drilling in the future. In this constant search, they have found new deposits of materials, developed new processes of manufacture, and have set a new standard in quality control. Wherever your rig is located . . . or whatever your drilling problem may be . . . Magcobar products and services are available to help you find a quick, effective solution.

Magnet Cove Barium Corp., *Houston, Texas.* Complete drilling mud service for the oil industry through 350 dealers at strategic locations.

Clark Bros. Co., *Olean, New York.* Engines and compressors—gas, steam and diesel driven. Slush pumps.

Dresser Manufacturing Division, *Bradford, Pa.* Pipe couplings, fittings and sleeves—rolled and welded rings—welding fittings and flanges.

Kobe, Inc., Division, *Huntington Park, Calif.* Complete hydraulic oil field pumping systems, including the Kobe Free Pump.

No. 2 in a series about Dresser Industries

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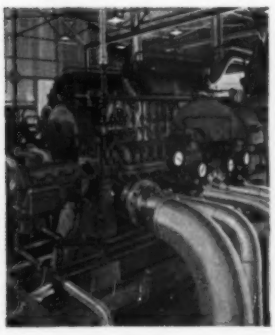
Dresser Industries, Inc., is a group of companies under common ownership with a single common interest . . . to serve the oil and gas industries with a wide range of the finest equipment and supplies possible.

Each company is a specialist and recognized leader in its field, yet each retains its corporate identity and management. The pooled resources of engineering know-how and research facilities of the entire Dresser Industries organization back each company.

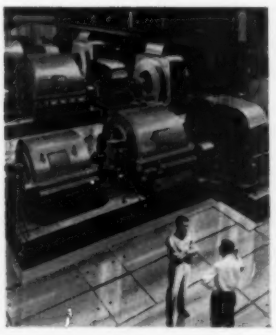
Individually or collectively, the Dresser group works in all its divisions helping to expand oil and gas facilities to meet the world's ever-increasing energy requirements. It is this planned association of companies and products that gives breadth and depth to Dresser's combined operations. This integrated line of equipment and coordinated service enables Dresser Industries to make *your* job easier and better.

Magnet Cove Barium Corporation provides the oil industry with a complete drilling mud service. In addition to mining and processing a variety of specialized drilling mud materials, Magcobar has an expansive dealer organization, a large staff of experienced field mud engineers who travel in laboratory-equipped cars and are backed up by modern research facilities. Magcobar developed and pioneered the flotation process to beneficiate barite. This and other of the company's advanced techniques have added millions of tons of barite reserves and have saved millions of dollars for the oil industry through lower costs.

DRESSER INDUSTRIES, INC.
OIL, GAS AND CHEMICAL EQUIPMENT
ATLANTIC BUILDING ★ DALLAS, TEXAS

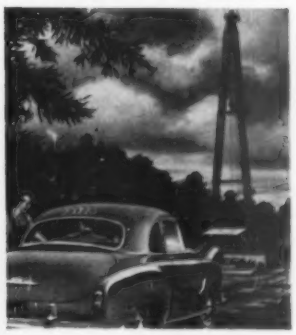


Pacific Pumps, Inc., *Huntington Park, Calif.* Centrifugal pumps, deep oil-well plunger pumps and boiler feed pumps.



Roots-Connersville Blower Division, *Connersville, Ind.* Rotary positive blowers, gas pumps; centrifugal blowers, exhausters; positive displacement meters.

Security Engineering Company, *Whittier, Calif.* Rock bits, reamers, casing scrapers, reamer rock bits, coring bits, securaloy.



Ideco Division, *Dallas, Beaumont, Tex., Torrance, Calif.* Derricks, drawworks, rambler drilling rigs, traveling blocks, rotary tables, swivels.

STEEL TUBES

and every kind of fitting,
including buttwelding seamless tees,
bends, reducers and welding-neck flanges
for building up welded pipe systems.

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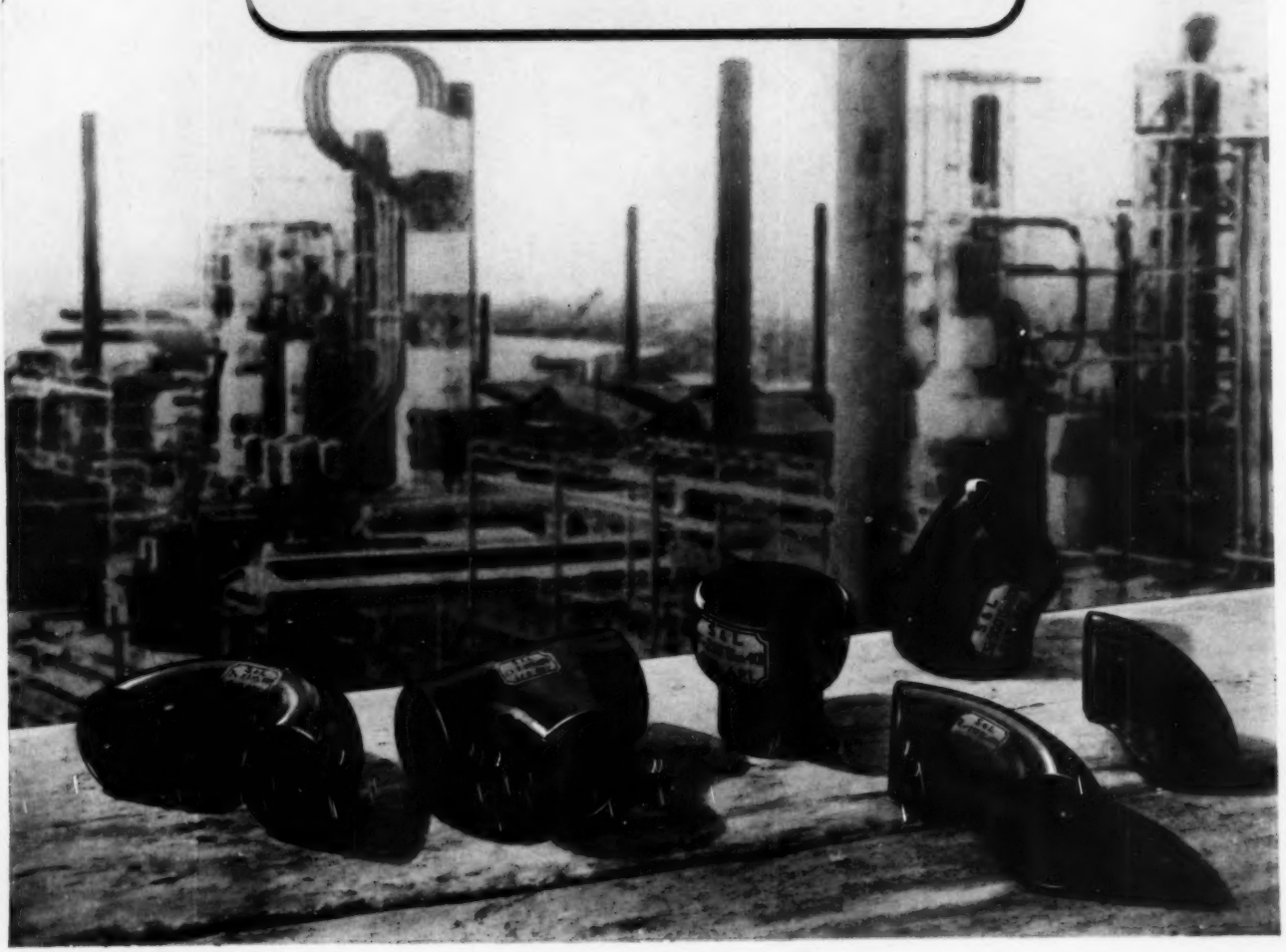

You can buy WORTHINGTON products manufactured in these countries...

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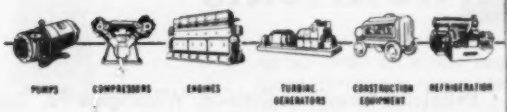
in the CORRESPONDING LOCAL CURRENCY

Many of the hundreds of Worthington products are manufactured in the countries listed above. This means that you can buy equipment that is *engineered and built to Worthington high-quality standards* in the local currency of any of these countries. For complete facts on Worthington facilities around the world, write for Bulletin WP-1099-B54 to Worthington Corporation, formerly Worthington Pump and Machinery Corporation, Export Dept., Harrison, N. J., U. S. A.

F.2.29



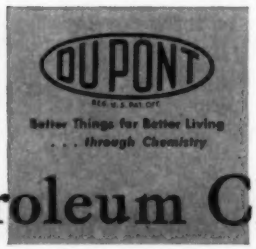
WORTHINGTON

The Sign of Value Around the World

Question: **What Company Has the Longest Experience in Making Tetraethyl Lead Antiknock Compound?**

Answer: Du Pont was the pioneer and only producer of TEL Antiknock Compound from 1923 to September 1945. In fact, it was Du Pont who developed the first safe process for manufacturing tetraethyl lead on a commercial scale.

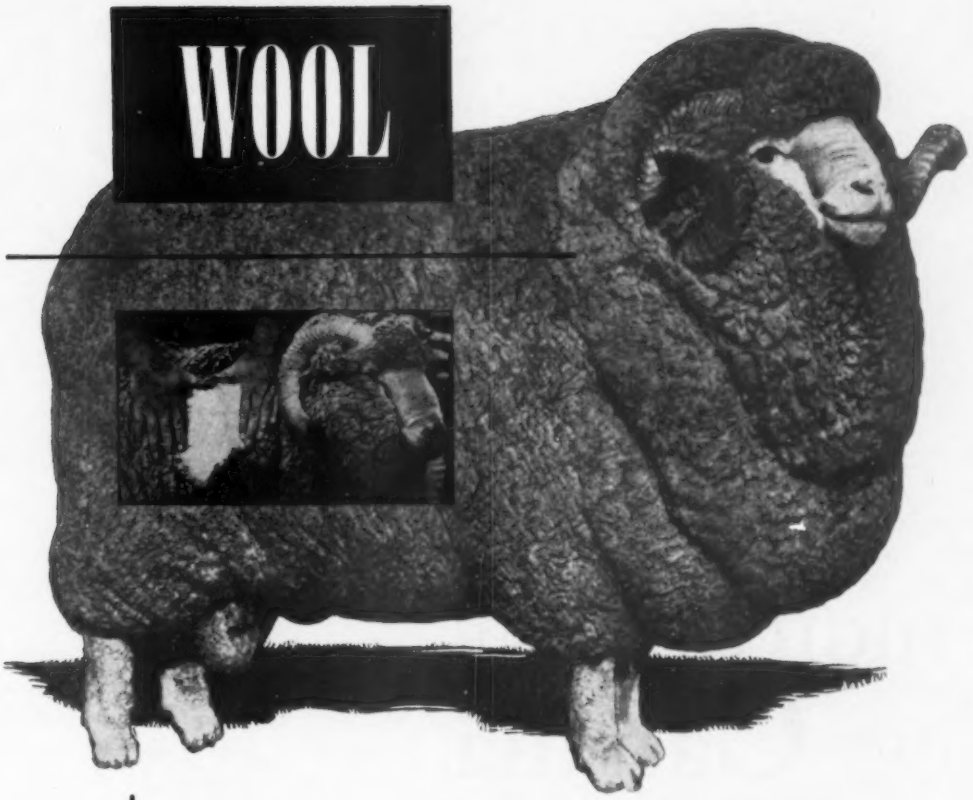
Recently, Du Pont perfected a complete new manufacturing unit for making tetraethyl lead. This development will speed the production of TEL and make more of it available for refiners. The new unit is another example of Du Pont's pace-setting research and development activities on behalf of the petroleum industry. Ask your Du Pont representative for the many other services available to you.



Petroleum Chemicals

E. I. DU PONT DE NEMOURS & CO. (INC.) • Petroleum Chemicals Division, Wilmington 98, Delaware

WOOL



wealth of the Commonwealth

Throughout the world
WOOL means **warmth**...
protection and
comfort for
man, woman, child.

And, throughout the world,
AUSTRALIAN WOOL
means **fine** wool...
soft, fleecy, **quality** wool.

Australia's
112-million sheep
today provide
1 out of every 4 pounds
of the world's supply...
more than half
of all the top-quality
Merino wool.

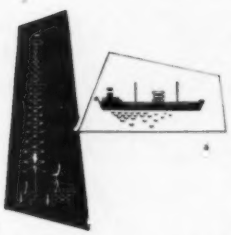
Wool is **one-third**
of Australia's
total export trade...
accounts for **one-tenth**
of the national income.

Another mighty important
commodity
to Australians is
OIL...

The petroleum products
which have aided
industrial expansion...
which give power,
light, warmth...
which fuel and lubricate
all manner of
modern transport.

More than a **billion**
imperial gallons
of oil products
each year
are the **life-blood**
in the arteries of
the Australian Commonwealth...
are helping to build
a stronger nation...
a better way of life
for the Australian people.

In Australia, as elsewhere
in the Eastern Hemisphere,
people know
they can depend on
the Stanvac organization
to supply this vital oil.



STANDARD-VACUUM OIL COMPANY

A name that stands for "Progress" in the East

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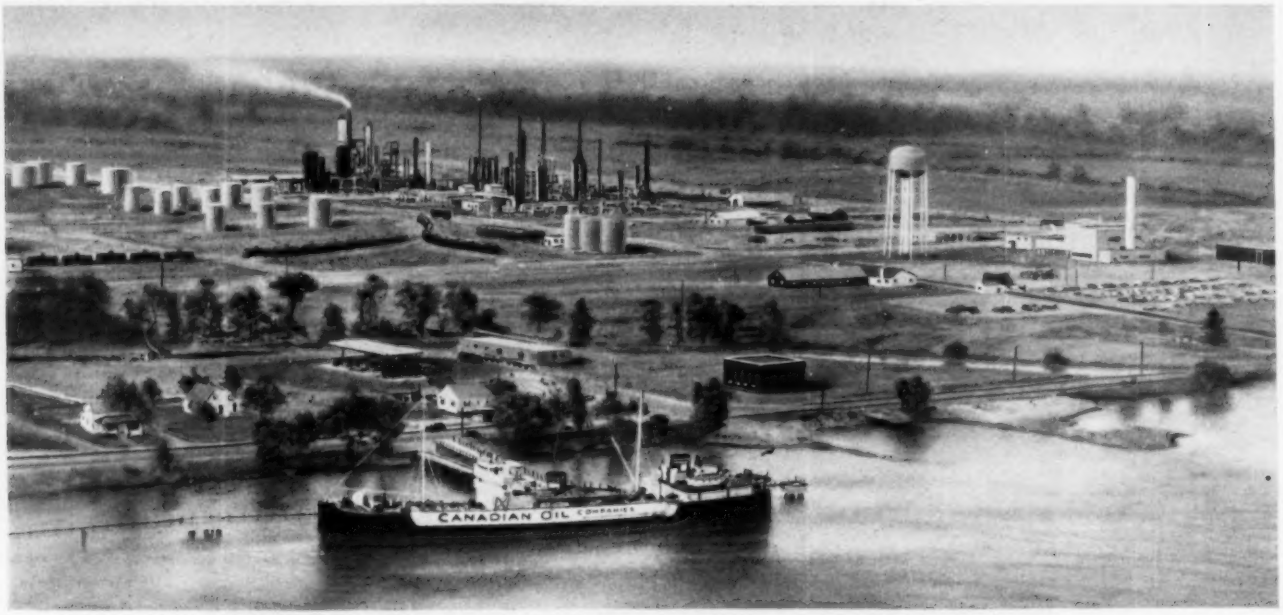
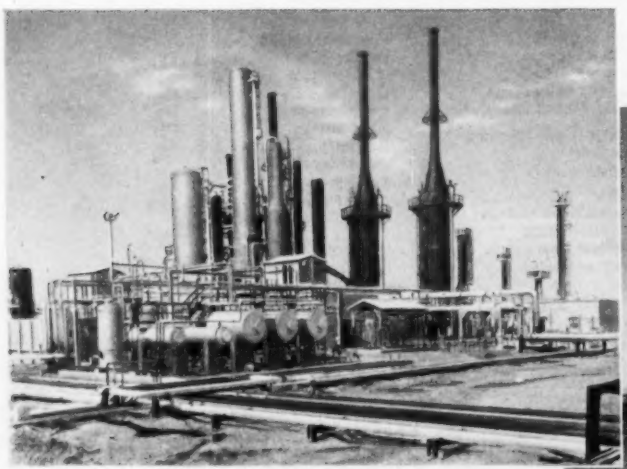
SOUTH PACIFIC ISLANDS • SOUTH WEST AFRICA • TANGANYIKA • THAILAND • UNION OF SOUTH AFRICA



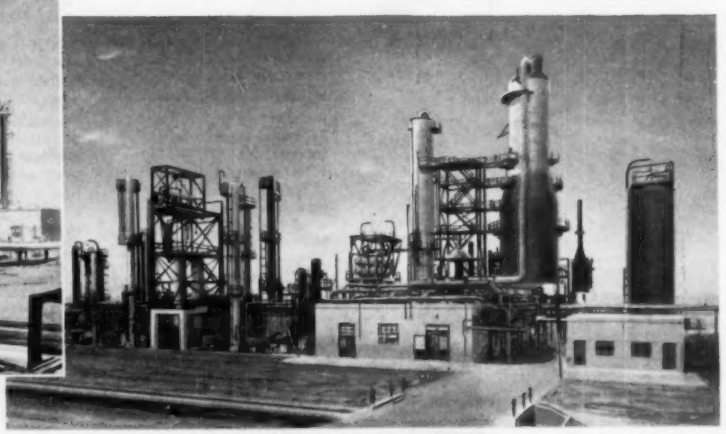
20,000 barrels per day of Alberta Crude oil are processed in the units of Canadian Oil Refineries' Sarnia, Ontario, plant on the St. Clair River

HIGH OCTANE FOR Canada

The design and construction of the new Sarnia refinery of Canadian Oil Refineries Limited were managed by Stone & Webster Canada Limited utilizing the facilities of Stone & Webster Engineering Corporation. It is the first fully integrated refinery in Canada entirely employing the latest processes for producing maximum yields of high octane gasoline. The project includes special equipment to prevent pollution of the river.



Crude Distillation Unit



Catalytic Cracking Unit

STONE & WEBSTER ENGINEERING CORPORATION

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STONE & WEBSTER CANADA LIMITED

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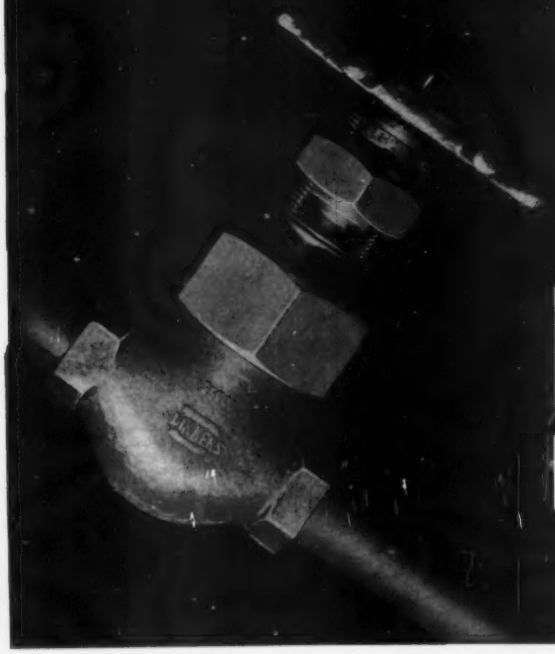
A COMPLETE LINE OF
DROP FORGED STEEL
VALVES
SERIES 600-900-1500
Ask for Oil Catalogue Nr. 480



DIKKERS
HENGELO-HOLLAND
Valve makers since 1879

Off-shore drilling is under way in the Persian Gulf as Aramco crews look for new deposits of oil.

Arabian American Oil Company

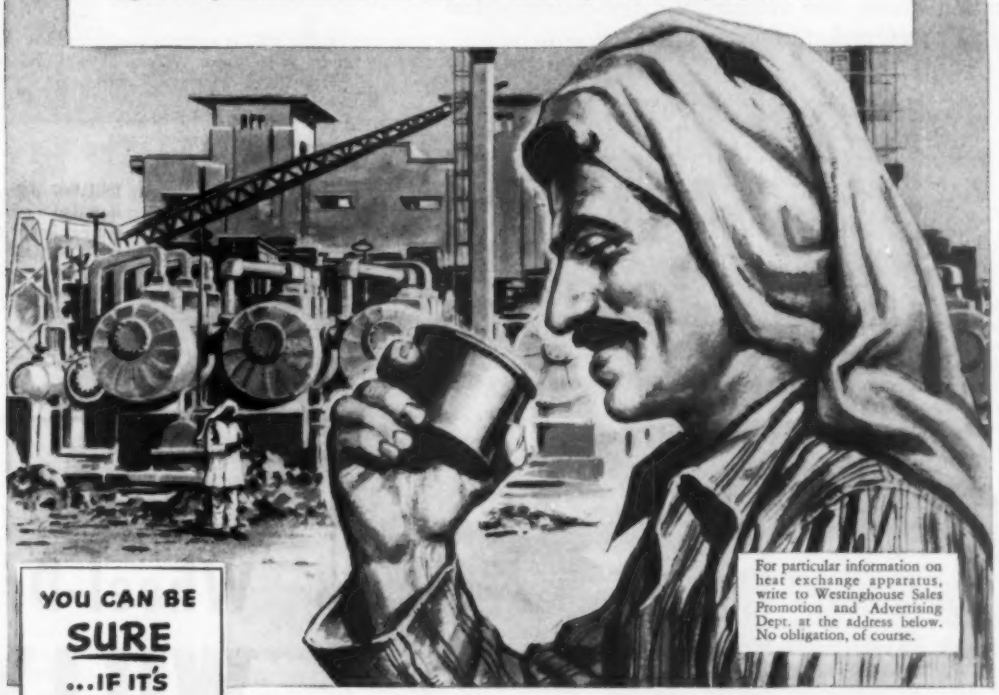
DHAHRAN NEW YORK

Drinking Water from the Sea

When the mercury jumps to 167 degrees Fahrenheit, drinking water becomes just about the most important thing in life. And when you have to be content with a brackish liquid imported from miles away and served from a goatskin by a vendor aboard a donkey—your thirst is never really satisfied.

That was how things stood until recently in the Arabian sheikdom of Kuwait—one of the world's most strategic spots because of the fabulous oil pool under its hot sands. Then the Kuwait Oil Company through the British firm of Ewbank & Partners, consulting engineers, ordered six Westinghouse evaporators to draw salt water from the Persian Gulf and turn it into clean, healthful drinking water at the rate of 750,000 gallons daily. Shaikh Abdullah al Salim al Subah saw these Westinghouse evaporators and promptly ordered ten more with a capacity of 1,200,000 gallons a day.

Westinghouse offers a complete line of heat exchange apparatus for steam power plant auxiliaries —whatever the size. A complete engineering service is at the disposal of private, state and municipal authorities to survey needs, design equipment for specific tasks and supervise installation and operation. *40 years of planning and building heat transfer equipment around the world* have given Westinghouse the extra margin of experience to solve successfully the most complex problems.



For particular information on heat exchange apparatus, write to Westinghouse Sales Promotion and Advertising Dept. at the address below. No obligation, of course.

YOU CAN BE **SURE** ...IF IT'S

Westinghouse

WESTINGHOUSE ELECTRIC INTERNATIONAL COMPANY

40 Wall Street, New York 5, U. S. A.

ONLY 4-WHEEL-DRIVE

...Goes Everywhere in the Oil Field!

Oil men judge a vehicle by its ability to take them wherever they have to go. Experience has taught them that nothing less than 4-wheel drive gives them the kind of transportation they need. That is why the 4-Wheel-Drive Willys Station Wagon is so widely used to carry personnel, supplies and equipment *everywhere* in the oil field. We will gladly send you complete information about this vehicle, and the name of the nearest Willys-Overland dealer, upon request.

PROSPECTING is easier when exploration parties use the 4-Wheel-Drive Willys Station Wagon to reach places where other vehicles cannot go.

DRILLING delays are reduced to a minimum when this car keeps crews supplied with the tools and equipment needed for any emergency.

PIPING is another oil field activity speeded by this "go-anywhere" vehicle as it shuttles back and forth with inspectors, maintenance men and replacement parts for heavy machinery.

4 Wheel-Drive WILLYS STATION WAGON

WILLYS-OVERLAND EXPORT CORPORATION
Toledo 1, Ohio, U. S. A.

st

modern
Cracking Unit
stream
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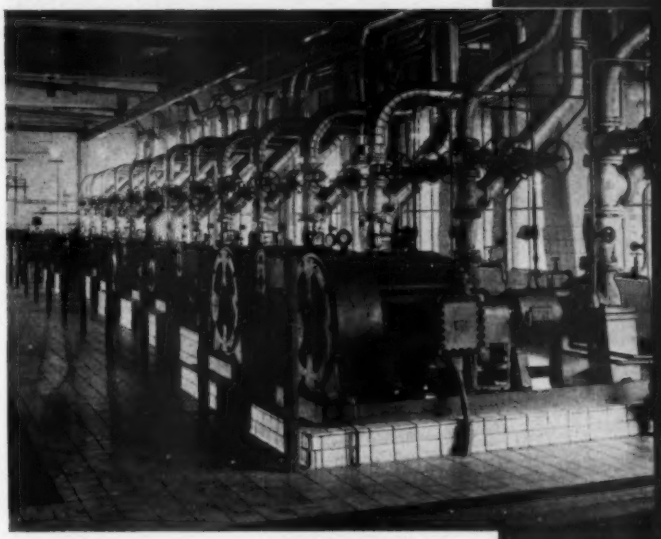

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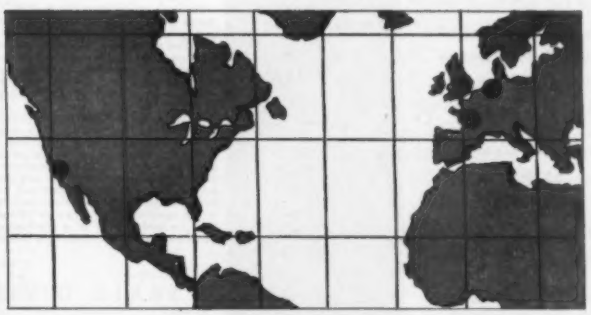

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X-2

This is a new and enlarged edition of the CRANE Mechanical Seals Booklet.

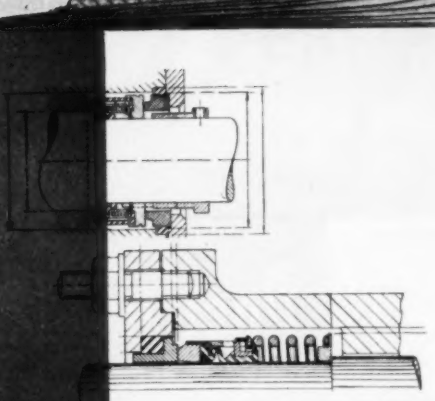
After a very considerable circulation, we have revised and enlarged the contents of our Mechanical Seals booklet and copies of the new edition are now available.

Four new Mechanical Seals are introduced; the COMPACT, types 6 and 7, and the MONITOR, types 8 and 9. These new COMPACT seals are designed for low-pressure applications, and the new MONITOR seals are simple, inexpensive and easily replaceable seals for mounting adjacent to ball and roller races or other bearings.

In the centre of the booklet, on pages 10 and 11, the treatise on 'Mechanical Seal Design' is again included, but it has been revised and brought up to date. On page 17, there are two new and most useful tables, one a table showing the applications for which the various types of seals are designed, and another table showing the component materials in which they can be made up in order to suit particular services.

All firms and individuals who are interested in the use of mechanical seals are invited to send their names and addresses to us and a copy of this booklet will be sent by return of post.

Requests for copies should be addressed to Crane Packing Ltd., Seals Division, Slough, Bucks.



Mechanical Seals

Mechanical seals are a relatively new solution to an old problem, i.e., to provide a pressure-tight seal around a rotating shaft. Sealing off by a mechanical device offers very important advantages in innumerable applications. It is not difficult to design a mechanical seal which will perform faultlessly and render completely trouble-free service under ideal operating conditions . . . but such conditions, although found on a new machine, seldom exist for very long, shaft movement and vibration normally increasing directly with the running hours. A mechanical seal must, therefore, be designed to perform efficiently despite the gradual deterioration of the operating conditions as the machine nears the end of its running life.

On pages 10 and 11 of this booklet, the considerations which influence the design and performance of mechanical seals are discussed in some detail, and on other pages our STANDARD, COMPACT and MONITOR seal units are described and illustrated. Whether a reader has or has not previously examined these particular mechanical seals, the design details are certain to be of more than passing interest, because certain features of the designs have so obviously been calculated to overcome what are well known causes of mechanical seal failure.

So far as the performance of STANDARD, COMPACT and MONITOR seals is concerned, they have been thoroughly tested over a wide range of applications, and we are particularly anxious that details of their performance should be made known to designers who may have considered the use of a mechanical seal, but who have previously hesitated to make basic changes in their equipment, until they were fully satisfied that the performance of a mechanical seal would give them the results they require.

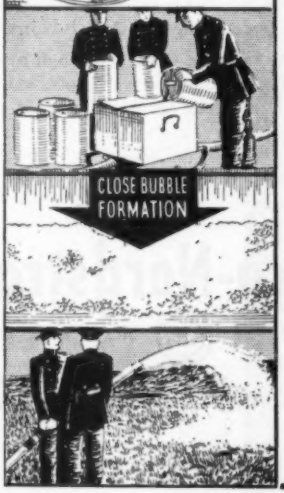
SEALS DIVISION

Crane Packing LTD OF SLOUGH ENGLAND

A (CRANE) COMPANY

Kills Oil & Petrol Fires with SPEED & CERTAINTY

Supplied in 2, 5 or 40 IMPERIAL GALLONS CAPACITY



★ Nicerol is supplied in heavy gauge steel drums designed for quick release and clean pouring.

★ Nicerol can be used in any type of mechanical foam or air foam apparatus. In this case a base injection type in-line inductor is being operated.

★ The secret of Nicerol effectiveness lies in the small bubble formation. It creates a tough, efficient blanket. 3 gallons of Nicerol and 100 gallons of water will produce over 1,100 Imperial gallons of foam.

★ The above gasoline and oil blaze was extinguished in a matter of seconds by a normal mix of Nicerol Foam Compound.

Meet the hazard of fire with Nicerol, the foam compound that kills any oil or gasoline fire quickly and absolutely. Nicerol is a concentrate, producing a heavy type foam of closely-knit small bubbles which form a tough, vapour-tight blanket over the surface of burning oil or gasoline. It is characteristic of Nicerol Foam that it flows with the fire and is highly resistant to flash-back or re-ignition. It can be used successfully in any type of mechanical foam or air-foam apparatus — is equally effective with salt water or fresh and can be stored for years without deterioration.

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For further particulars, samples, catalogues, etc.:

The Royal Navy and the Royal Air Force use it and so do Oil Companies, Fire Equipment Manufacturers, Civil Air Lines, several Commonwealth and Foreign Government departments, and Fire Brigades throughout the world. What better recommendation?

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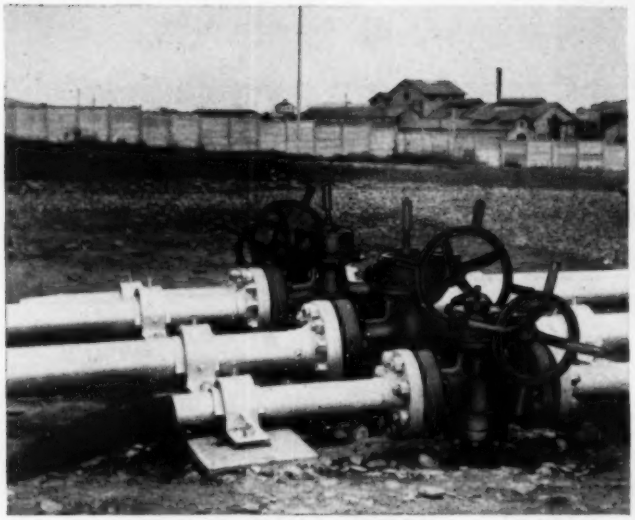
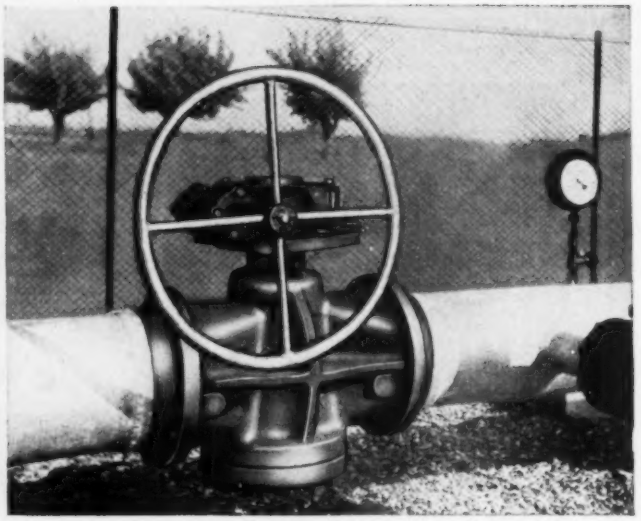
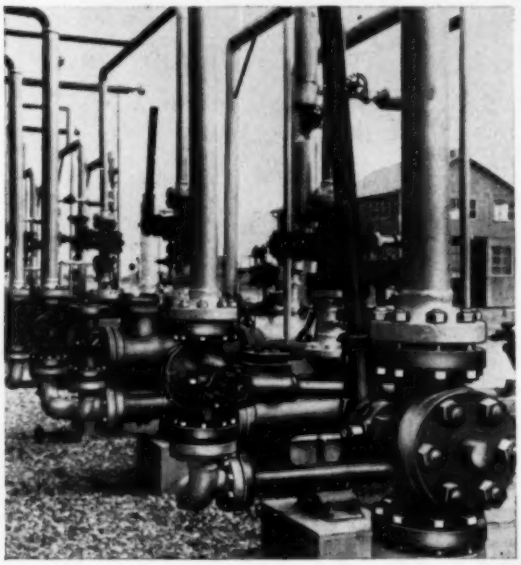




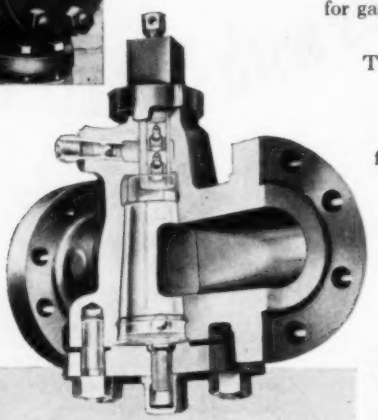


Wherever the World's Petroleum is found *there's work for* Audco-Nordstrom Valves

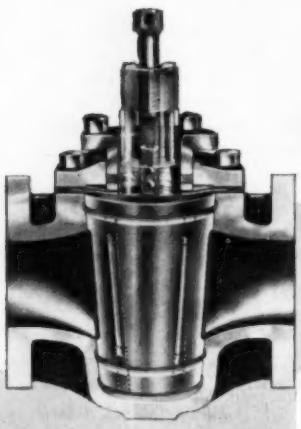
For drilling, production, refining, pipe line and distribution—for gas and petroleum in all its phases—there's an Audco-Nordstrom valve equal to the job.

The record of their success in world-wide installations over 30 years parallels the growth of modern petroleum technology. Being lubricant sealed, they are doubly tight. Hard-to-hold gases and fluids are perfectly controlled by Audco-Nordstroms.

A complete range of sizes, types and materials assures the proper valve for each specific service. Write for descriptive literature.



Hypreseal type Audco-Nordstrom valve for higher pressure services.



Standard bolted gland Audco-Nordstrom valve. Screwed gland in sizes 4" and smaller.

Audco-Nordstrom

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The World's Most Famous Motor Oil

Scientifically designed to keep ahead of performance demanded by today's modern motors, VEEDOL goes far beyond mere motor oil performance to keep modern motors *cleaner, safer, smoother-running*. VEEDOL'S famous "Film of Protection" brings you the kind of "Dream Car" performance that belongs in *your* car. Remember, the use of quality oil is your best insurance for your car, whatever the make or year.

TIDE WATER ASSOCIATED OIL COMPANY

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Over and Over and Over AGAIN

McCullough Bullet Type Gun Perforators consistently prove to be the hardest shooting bullet type perforators in the world.

And proof is even more conclusive and timely, when, after perforating with other types of bullet perforators, McCullough recently perforated the same wells, with

day after day, year after year—in oil fields all over the world—wherever oil operators measure perforating efficiency in B/D.

production increases of: 6 B/D to 90 B/D; 0 B/D to 100 B/D; 60 B/D to 150 B/D; 30 B/D to 70 B/D; etc.

Add to this, burrless holes (produced by exclusive McCullough Burrless Bullets); exact spacing; the strongest gun body; and the fact that McCullough holds all world records for speed, efficiency and results. Factors contributing to — or the result of — deeper, cleaner holes, consistently.

Is it any wonder that McCullough Bullet Type Gun Perforators are the choice of leading oil operators, as evidenced by the fact that McCullough does most of the large perforating jobs.

Consistency means dependability.

Call Your McCullough Service Engineer today. He will explain the technical reasons for these remarkable results. Or, if you prefer, write for the McCullough Technical Bulletin 201—do it TODAY!

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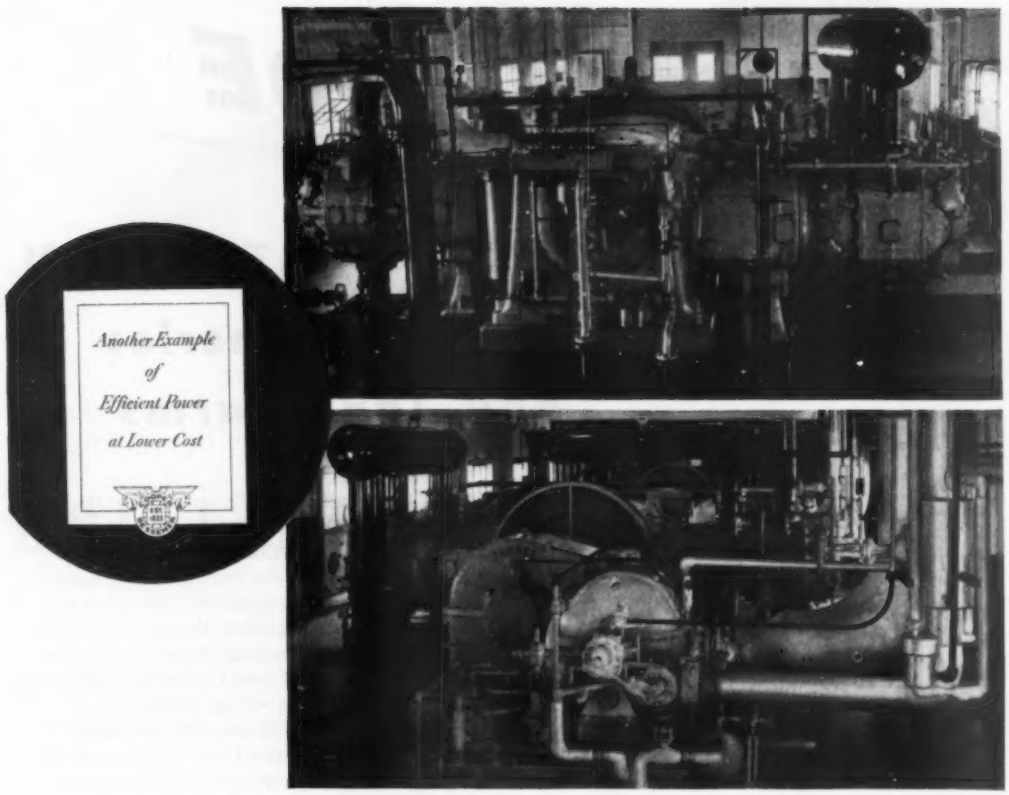

In Refinery Service . . .

COOPER-BESSEMER MOTOR OR TURBINE DRIVEN COMPRESSORS

. . . for continuous operation . . . for minimum down time

● The units shown above are Cooper-Bessemer M-Line compressors in Continental Oil Company's Billings Refinery. They are turbine driven, with reduction gears, and are handling vapor and recompressor gas through 2 stages, from 17 psi to 253 psi discharge.

During their two years of continuous operation, these units have shown a typical M-Line record — smooth, trouble-free performance, minimum down time and completely satisfactory behavior in general. The reasons are simple. Combined in these units are many of the features that have contributed to the success of Cooper-Bessemer engine-driven horizontals and modern V-Angles — features that come only from years of practical experience and painstaking development work in compressor design and construction

If you have new jobs coming up requiring either motor or turbine driven compressors get all the facts on modern Cooper-Bessemers. They are available in sizes from 250 to 5,000 horsepower.

The
Cooper-Bessemer
Corporation

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WORLD WIDE

FIRE PROTECTION
for Oil Refineries and Tank Farms

Pyrene Fire Protection Equipment for bulk oil fire risks is in use in the following countries:—Australia, New Zealand, Canada, South Africa, India, British West Indies, British Borneo, Colombia, Indonesia, Egypt, Iran, Iraq, Sarawak, Saudi-Arabia, France, Belgium, Italy, Norway, Netherlands, Netherlands West Indies, Cyprus, Switzerland, Spain, Venezuela, Aden, Kuwait and the United Kingdom.

"Pyrene" Foam Tenders are universally recognised as the latest and most practical form of fire protection for Oil Tank Installations, Refineries and large Chemical Works. Designed for rapid transit, they carry their own foam compound supply, "Pyrene" Foam Generators or Branchpipes, a fire pump and all necessary equipment for extinguishing bulk oil or spirit fires. Each "Pyrene" Foam Tender is especially designed to meet the particular risks involved. Other Pyrene Equipment includes:—Complete fixed Foam Installations—Foam Trailers—Mechanical Foam Generators—Foam-making Branchpipes—Foam Towers and Pourers—Chemical Foam Appliances—CO_2 Installations and portable Equipment, and Fire Extinguishers using Foam, CO_2, CO_2-Dry Chemical, Special Liquids, Soda-acid and Water.

Our Foam Division will be pleased to provide free and impartial advice on your fire problems. Please write to:—

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(Dept. WP.9), 9 Grosvenor Gardens, London, S.W.1, England.
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FIRE FIGHTING EQUIPMENT

Three Pyrene Foam Tenders supplied to the Esso Petroleum Company's Refinery at Fawley.

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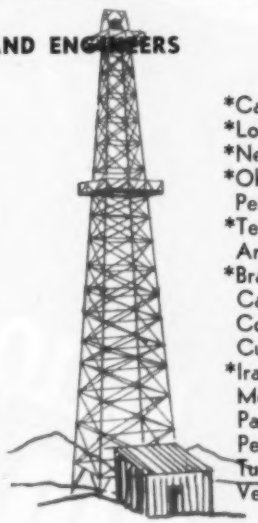
GEOLOGISTS AND ENGINEERS



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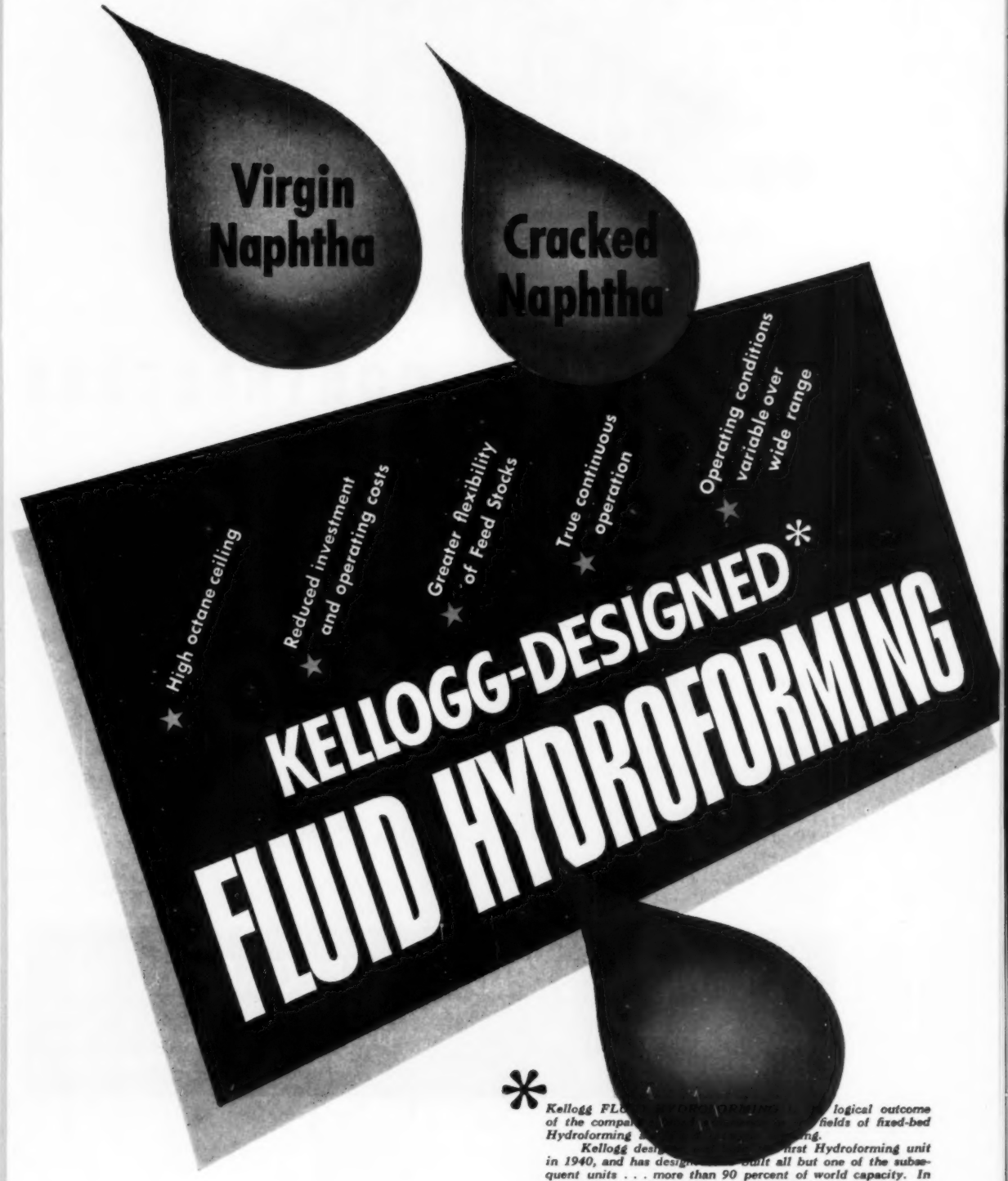


* *Kellogg FLU... logical outcome of the compan... fields of fixed-bed Hydroforming ... ng.*

Kellogg desi... first Hydroforming unit in 1940, and has design... built all but one of the subsequent units . . . more than 90 percent of world capacity. In the field of Fluid catalytic cracking, Kellogg has engineered better than 70 percent of world capacity.

Comprehensive data on Fluid Hydroforming for both naphtha upgrading and aromatics production — from the company's own pilot plants and from all other authoritative sources—is available to Kellogg customers.

Wide Flexibility in Operating Conditions!

Kellogg-designed *FLUID* HYDROFORMING units, the *modern* reforming equipment that brings the efficient *fluid* catalyst technique to the upgrading of naphthas, are engineered to provide wide flexibility in choice of operating conditions.

Catalyst level in the reactor can be varied over wide limits. The turbulent catalyst bed serves to improve catalyst-feed contact, and also functions as an important aid in temperature control. Steady, uninterrupted production of desired quality may be maintained continuously on any given feed stock, since fresh catalyst may be introduced as necessary to maintain desired catalyst activity and selectivity.

Fluid Hydroforming provides higher octanes from low quality naphthas. And since it is a continuous, regenerative process, it is adjustable to a variety of feed stocks from hexanes (for benzene production) to kerosene, including virgin heavy naphthas, high-sulphur cracked naphthas and mixed virgin-and-cracked feed.

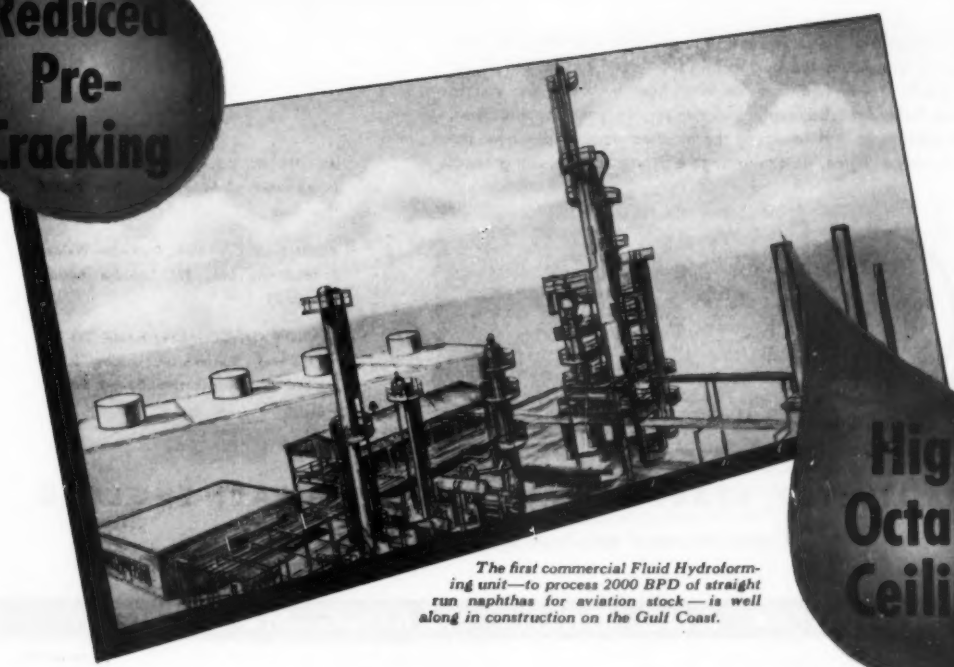
Fluid Hydroforming is not only more economical in operation but also requires a lower initial investment than comparable fixed-bed equipment. If you are considering expansion or renewal of naphtha processing facilities, a study of *Fluid* Hydroforming advantages will be rewarding.

A Kellogg bulletin, "FLUID HYDROFORMING", gives detailed pilot plant data on the performance, yields and octane ceilings of the process. Copy will be mailed on request.

THE M. W. KELLOGG COMPANY

for fifty one years an integral part of refining progress!

Reduced Pre-Cracking

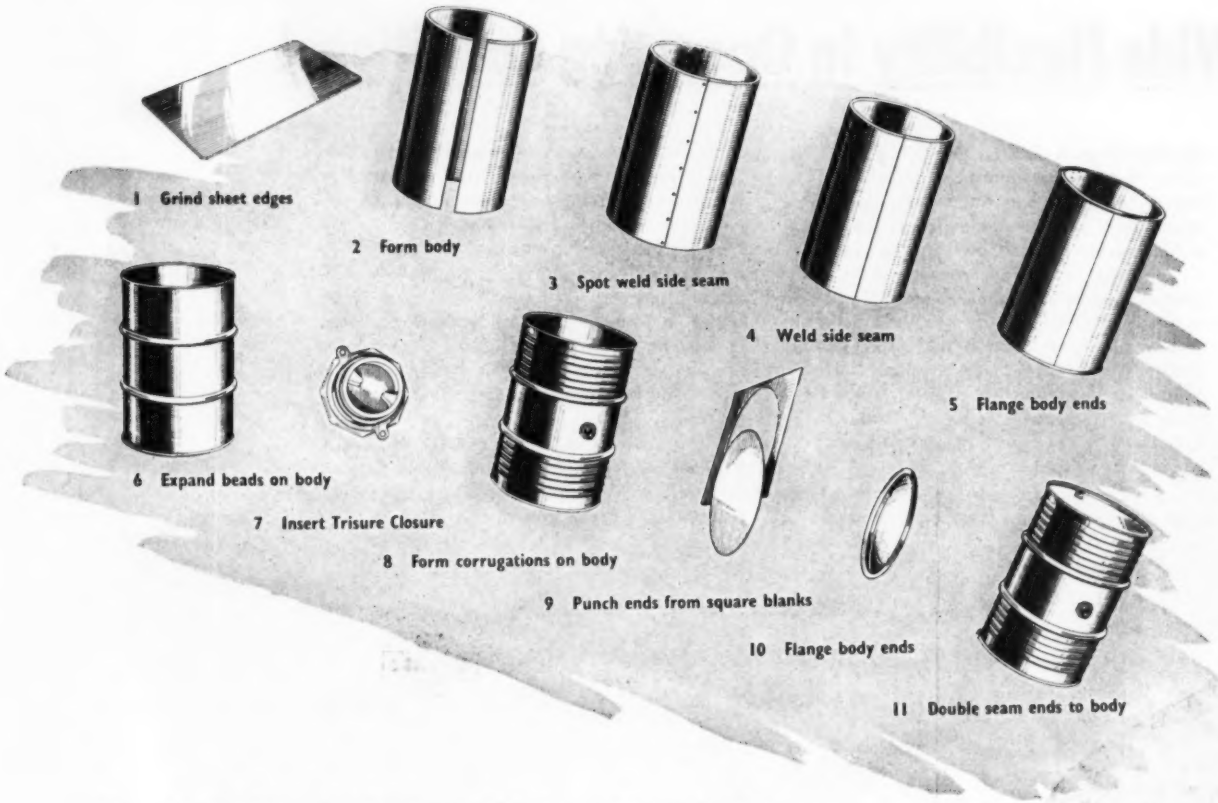


The first commercial Fluid Hydroforming unit—to process 2000 BPD of straight run naphthas for aviation stock — is well along in construction on the Gulf Coast.

High Octane Ceiling

NEW YORK JERSEY CITY LOS ANGELES TULSA HOUSTON TORONTO LONDON PARIS

TEAM WORK MAKES THIS A WINNING ELEVEN


1 Grind sheet edges
2 Form body
3 Spot weld side seam
4 Weld side seam
5 Flange body ends
6 Expand beads on body
7 Insert Trisure Closure
8 Form corrugations on body
9 Punch ends from square blanks
10 Flange body ends
11 Double seam ends to body

We consistently field an unbeatable eleven to tackle the essential operations in drum manufacture. Over 40 years' experience lies behind the design and production of our teams of drum making plant. If you feel that the time has now come for you to produce your own drums, instead of buying finished drums to your specifications, we should be pleased to advise you and to supply the most economical plant for the job. In short, if you wish to play at home, we can arrange a fixture on your own ground.

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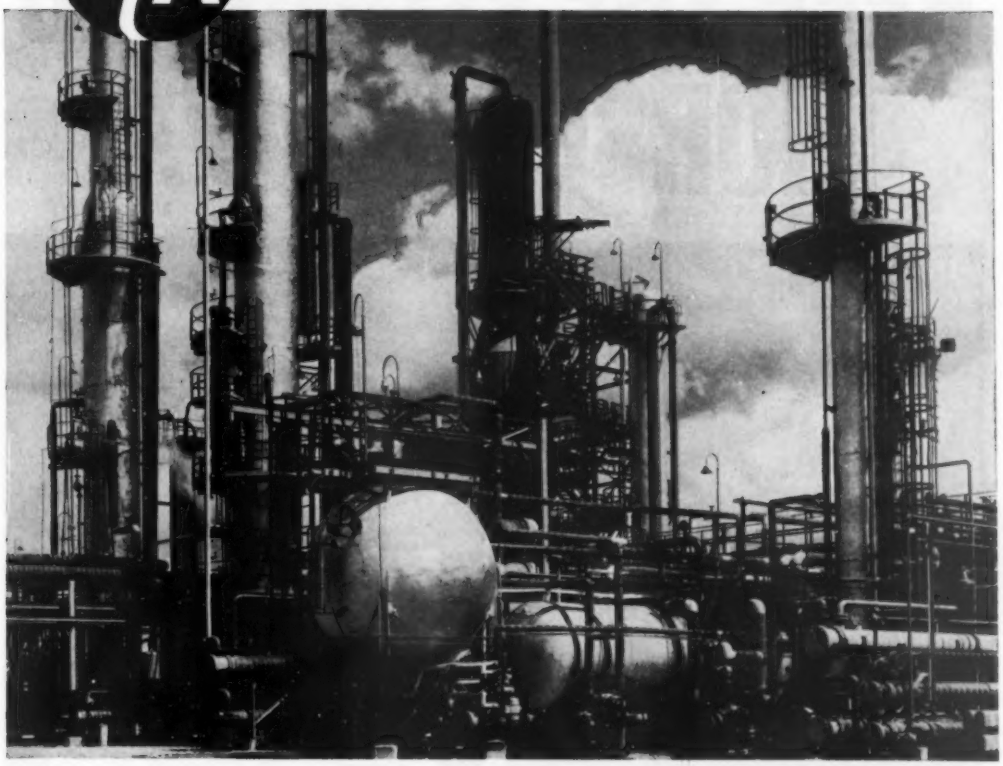
THE BRITISH AMERICAN OIL COMPANY LIMITED

another leading refiner who desalts with PETRECO



At Edmonton, Alberta, The British American Oil Company Limited has recently put into service a complete new refinery. Intended to handle production from Canada's great western oil fields, this new British American installation incorporates the most modern developments in refining technology. Like other leading refiners everywhere, British American at Edmonton relies on Petreco for desalting.

The Petreco desalter illustrated above desalts 5200 barrels per day of Redwater crude, with salt removals ranging from 94% to 96%. The electrosphere is one of Petreco's new high-efficiency, high-throughput spheres, eleven feet in diameter.

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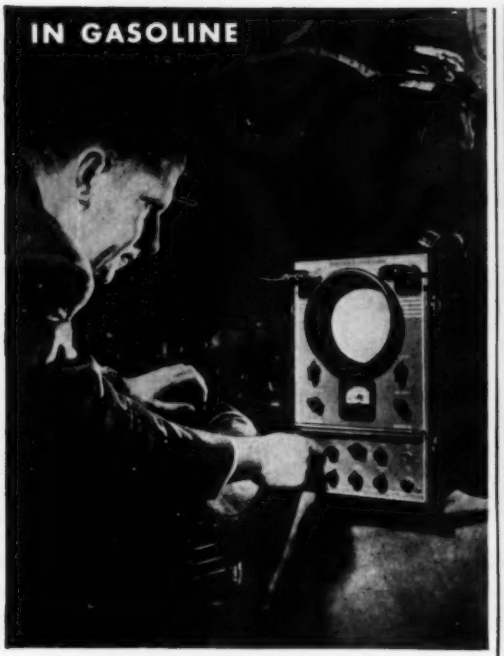
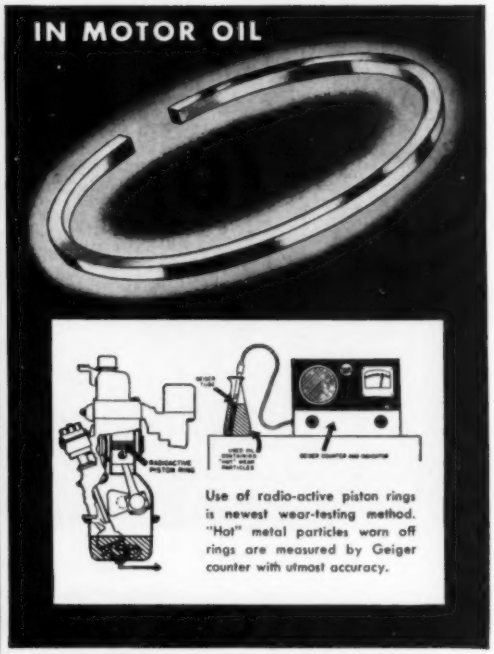
Continual Research and Development

KEEP THE FLYING RED HORSE *AHEAD!*




IN MOTOR OIL
RADIOACTIVE PISTON RING
Use of radio-active piston rings is newest wear-testing method. "Hot" metal particles worn off rings are measured by Geiger counter with utmost accuracy.

Power-Packed Mobilgas and Mobilgas Special

This amazing "X-Ray Eye" engine analyzer—an exclusive Flying Red Horse invention—shows in a strikingly new way what goes on inside a running engine. It helps automotive engineers determine exactly what gasoline qualities modern car engines need for top performance... helps Socony-Vacuum scientists meet those needs in Mobilgas and Mobilgas Special!

Mobiloil's New Super-Detergent Formula

Now, an amazing new combination of ingredients helps Mobiloil stretch engine life, by drastically reducing corrosive wear during periods when most wear occurs... during starts and warm-ups, and stop-go driving! Here is another example of how continual Flying Red Horse research and development keep Mobiloil ahead in quality—and in sales around the world!

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SAVE STEEL and SAVE MONEY with

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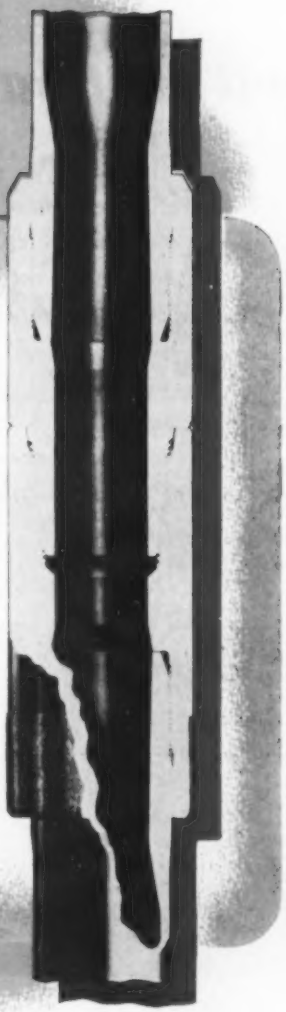
Super Shrink-Grip TOOL JOINTS



Drill pipe lasts longer when **REED** Super Shrink-Grip Tool Joints are used because there is no cutting or welding required when tool joints are replaced. Drill pipe life is not limited by tool joint replacement.

You save money, too, because tool joint replacement costs are reduced. You save transportation costs and lost rig time because **REED** Super Shrink-Grip Tool Joints can be quickly replaced right at the rig.

You save with safety, too, because **REED** Super Shrink-Grip Tool Joints are exceptionally strong and long wearing. See your nearest **REED** Representative for full information.

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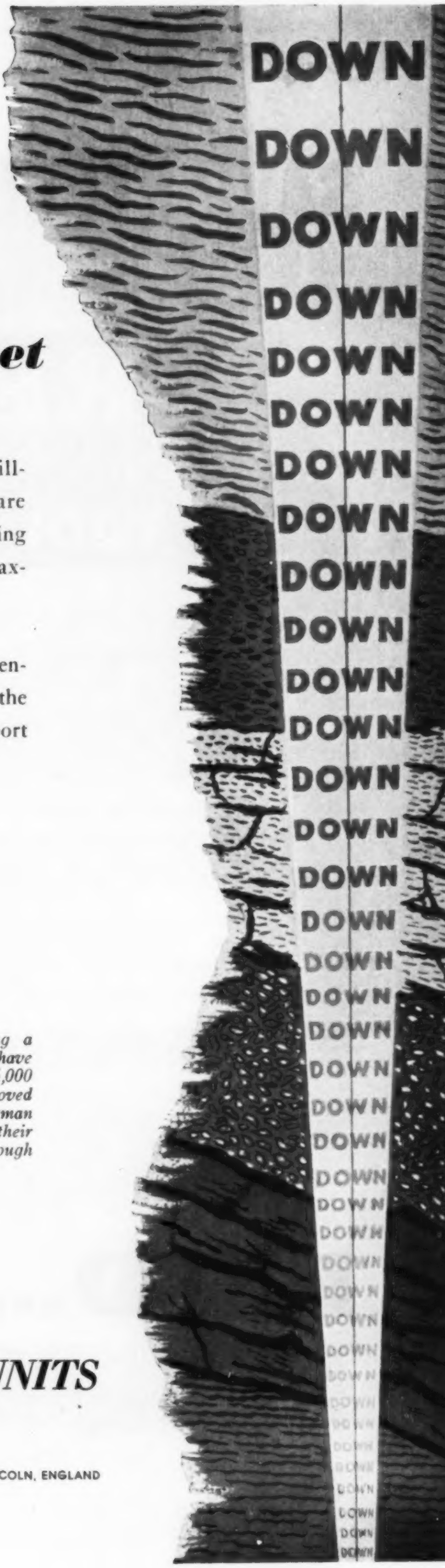
oil well drilling at 15,000 feet

The ever-increasing demands of an oil-thirsty world require drilling to greater depths in sinking wells. Higher engine powers are called for, and to meet this need Paxman diesel engines are being used. The power-unit in most common use is the RPH class Paxman "Package" set.

The design of this set permits easy interchange or service of the engines. It is a compact, self-contained unit which, by virtue of the robust skid-type underbase, can be handled on and off transport with ease.

Three of these units, forming a compound outfit of 1,200 b.h.p. have been drilling to a depth of 15,000 feet in Venezuela, and have proved the adaptability of the Paxman "Package" sets, as well as their ability to stand up to really rough handling and rigorous work.



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ASSOCIATED WITH RUSTON AND HORNSBY LTD., LINCOLN, ENGLAND

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Eight decades ago 70% of all gainful workers in the U. S. A. toiled in agriculture. Today farms and factories, put together, account for less than 40%.

Where do the rest serve? Chiefly in distribution, which includes the physical movement of products to buyers, and all forms of selling, advertising and sales promotion at the manufacturing, wholesale and retail levels, as well as the widely varied services related to the maintenance and use of American products.

With over 60% of our total labor force falling outside of farm and factory employment, obviously salesmen on the front line of selling contribute greatly to the productivity, prosperity and the world's highest standard of living enjoyed by the U. S. A.

Without sales a business fails and jobs vanish. No matter how good a product may be, it must be sold in competition with other goods. A salesman sometimes finds his products not truly competitive. He then exercises tremendous pressures on his employer for better products, lower prices, or both. Thus, competitive selling greatly influences the progress of American prosperity.

Countries where selling is inefficient, restricted or eliminated generate far less wealth, happiness and security.

Competition, especially competitive selling, is a great American Freedom. Let us preserve it to assure Progress For All Our People.

• • •

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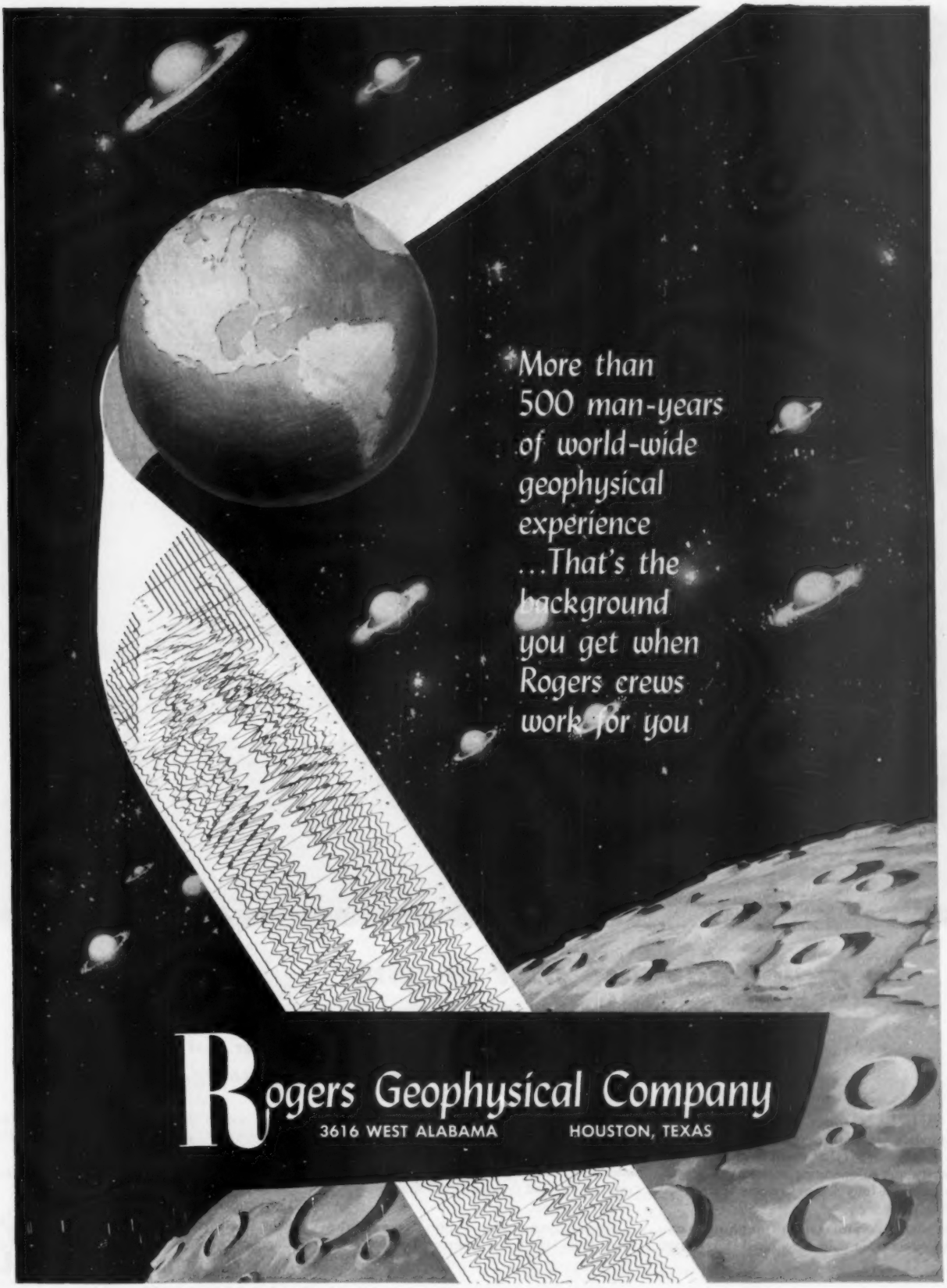
THE COMPETITIVE SYSTEM DELIVERS THE MOST TO THE GREATEST NUMBER OF PEOPLE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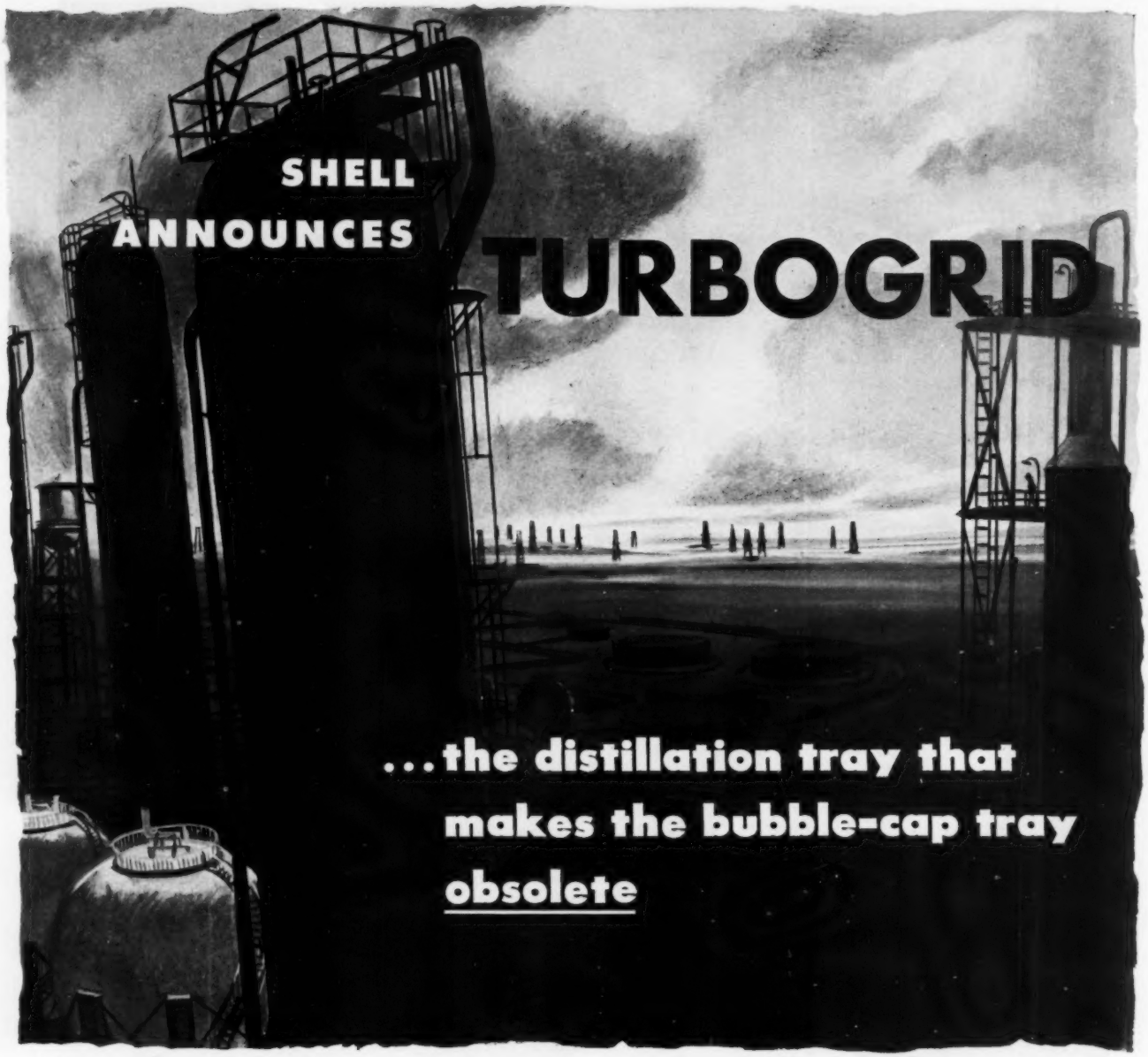

a major advance that permits

(a) breaking existing plant bottlenecks
(b) full new plant capacity at lower cost
(c) long tray life, easy maintenance

SHELL's simple Turbogrid tray offers outstanding advantages in performance and cost . . . advantages that result in much **higher capacity** and in operating economy. Performance has been fully *proven* in many commercial installations.

Turbogrid trays **increase throughput in existing towers,** or deliver required throughput at lower cost in new plant construction. The greatest capacity advantages are obtained with critical separations, such as depropanizers and stabilizers. Still other advantages are lower column holdup and pressure drop, as well as easier column control.

Simple construction assures lower fabrication, installation and maintenance costs and easier accessibility to all parts of the tray. Standardized design permits use of **corrosion-resistant alloy trays at no extra cost.**

Your inquiries are invited. Turbogrid trays are available from selected contractors, licensed by Shell Development Company.

SHELL

SHELL DEVELOPMENT COMPANY
50 WEST 50TH STREET · NEW YORK 20, N. Y.

You've Heard About Bethlehem's H-150 ...you're going to hear more!

Bethlehem's H-150, a pump for light rotary work, has been in the family for several months now. Long enough for almost everybody to hear about it. Long enough for drilling men to buy it and try it.

Out in the field, the only real proving grounds, the H-150 has done a swell job—for it's a sturdy, tough little unit with features reflecting the best in slush-pump engineering. Just take a look at these points: Complete oil-bath lubrication... pulley extension both sides... all-steel fluid end... API metal ring gaskets on valve covers, stuffing box housing flanges, discharge flanges, strainer housing flanges... telltale hole protecting fluid end from washouts if packing fails... alloy-steel gear made from rolled seamless forging... alloy-steel pinion... roller bearings throughout.

Specifications? Here they are:

Bore, 7¼ in. . . . stroke, 12 in. . . . maximum input bhp at 70 rpm, 191 . . . maximum working pressure, 1185 lb. . . . gear ratio, 5.536 to 1 . . . weight less skids, 16,500 lb.

While the H-150 is designed primarily for pumping on fairly shallow drilling jobs, it's also excellent for mud-mixing and for lease gathering work. One of the things most liked about this well-built pump is its *versatility*—something you're going to hear more about as time goes on.

BETHLEHEM STEEL EXPORT CORPORATION
25 Broadway, New York 4, N.Y., U.S.A.
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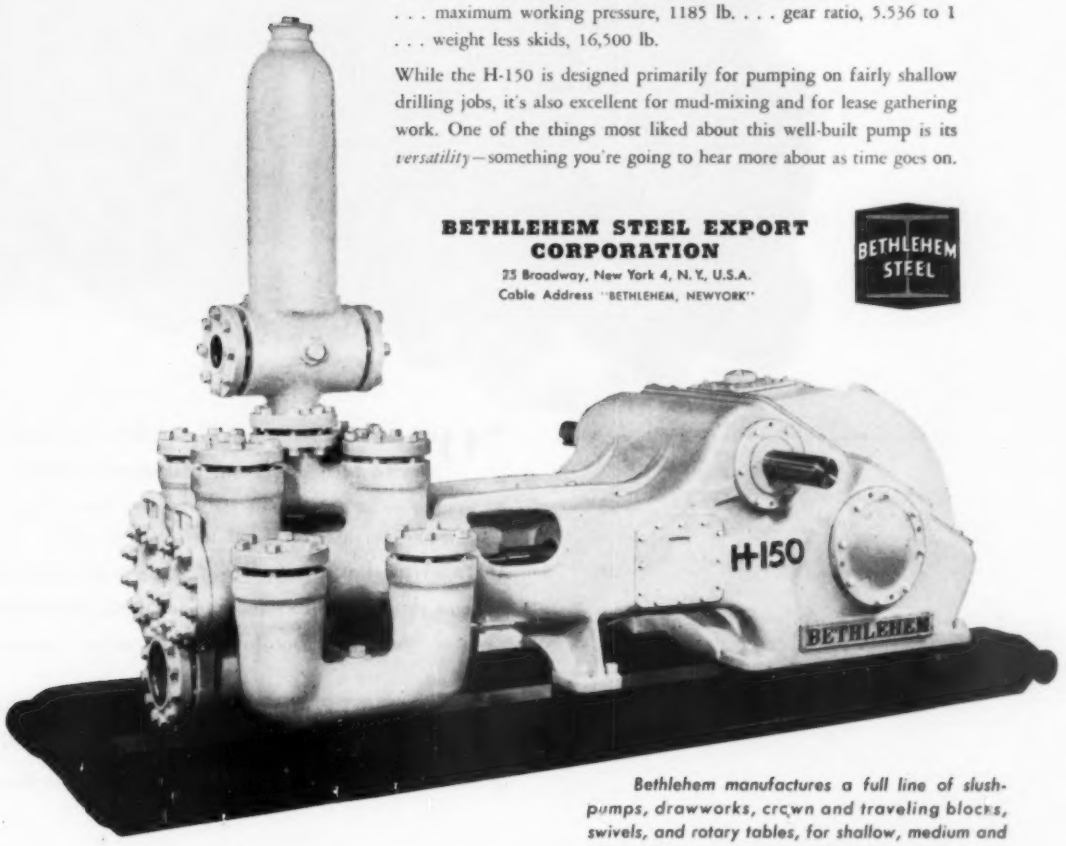
BETHLEHEM STEEL

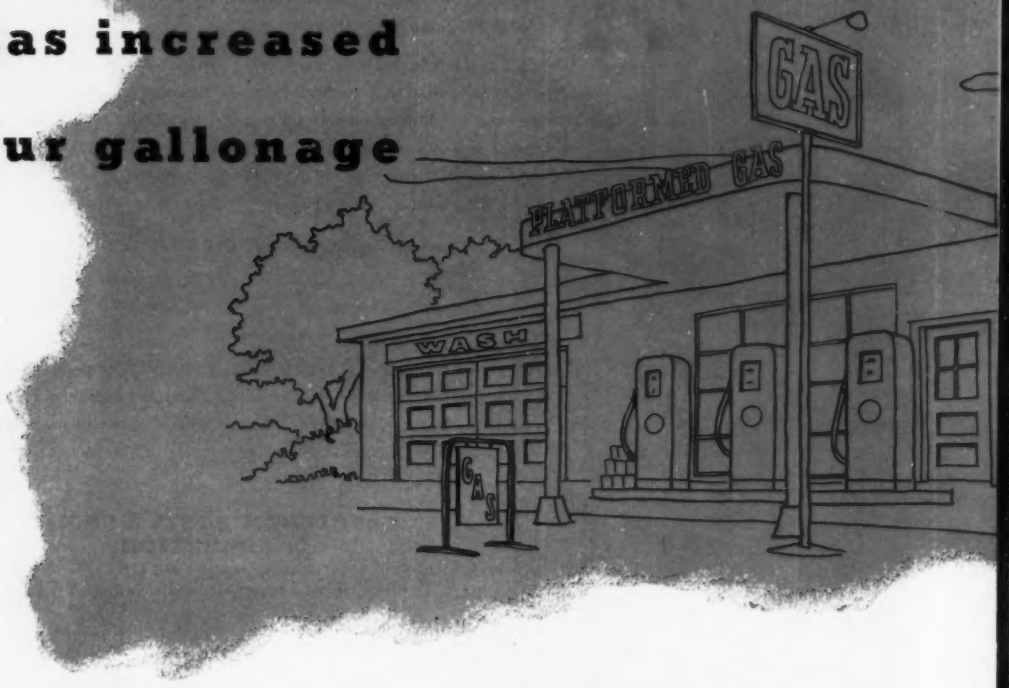


Bethlehem manufactures a full line of slush-pumps, drawworks, crown and traveling blocks, swivels, and rotary tables, for shallow, medium and deep drilling; and, for production work, pumping units in a wide range of sizes and types.

it's a matter of record...

PLATFORMING

has increased our gallonage



"Our jobbers have stepped up their gallonage since they've been delivering Platformed gasoline. And no wonder — at the rate the stations have been pumping it!"

That's a typical expression from refiners' sales managers who are now supplying direct and jobber outlets with Platformed gasoline. And the reason for this sales surge is no secret.

It's performance. Platformed gasoline has proved its superiority under all kinds of driving conditions and in all types of automotive engines. Motorists have tried it—liked it—

recommended it . . . and their preference has been evidenced in the growing sales volume over the past three years.

Increased gallonage is one of the important reasons why it pays to choose Platforming—the *proved* reforming process. It's a matter of record.

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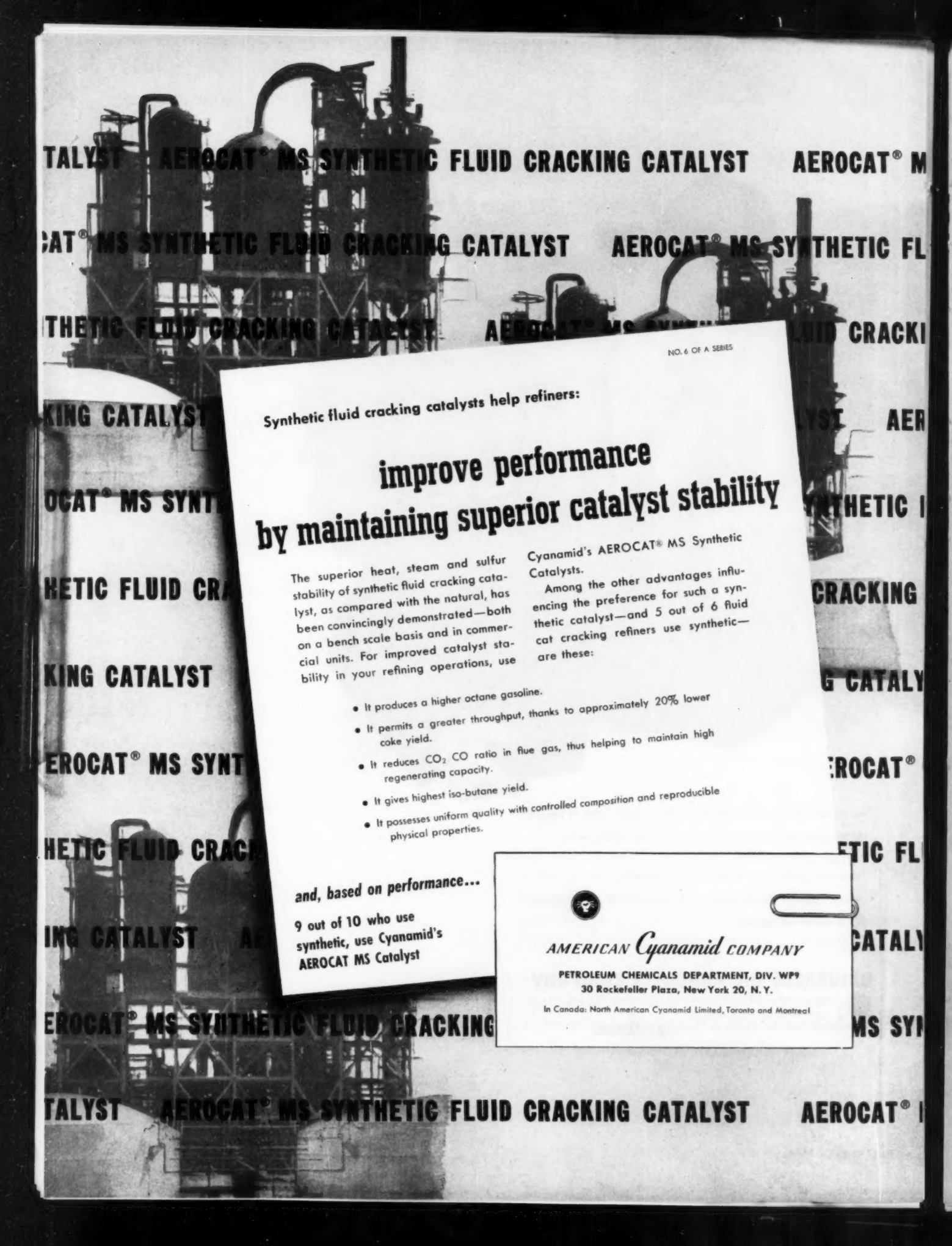
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NO. 6 OF A SERIES

Synthetic fluid cracking catalysts help refiners:

improve performance by maintaining superior catalyst stability

The superior heat, steam and sulfur stability of synthetic fluid cracking catalyst, as compared with the natural, has been convincingly demonstrated—both on a bench scale basis and in commercial units. For improved catalyst stability in your refining operations, use Cyanamid's AEROCAT® MS Synthetic Catalysts.

Among the other advantages influencing the preference for such a synthetic catalyst—and 5 out of 6 fluid cat cracking refiners use synthetic—are these:

- It produces a higher octane gasoline.
- It permits a greater throughput, thanks to approximately 20% lower coke yield.
- It reduces CO_2 CO ratio in flue gas, thus helping to maintain high regenerating capacity.
- It gives highest iso-butane yield.
- It possesses uniform quality with controlled composition and reproducible physical properties.

and, based on performance...

9 out of 10 who use synthetic, use Cyanamid's AEROCAT MS Catalyst

AMERICAN Cyanamid COMPANY

PETROLEUM CHEMICALS DEPARTMENT, DIV. WP9
30 Rockefeller Plaza, New York 20, N. Y.

In Canada: North American Cyanamid Limited, Toronto and Montreal

VOL. 23 NO. 10
SEPTEMBER 1952

World Petroleum

THE MANAGEMENT PUBLICATION OF THE INTERNATIONAL PETROLEUM INDUSTRY

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THIS MONTH S COVER

This view of Pride's Landing in the famous Muscle Shoals area near Pride, Alabama, shows the point at which Texas Eastern Transmission Corporation's new 30-inch natural gas pipe line crosses the wide Tennessee River. The huge barge at the landing is fitted with drilling equipment used in preparing a river bed ditch for the pipeline. Cover plates are reproduced through the courtesy of Jack Clarke, director of public relations for Texas Eastern Transmission Corporation.

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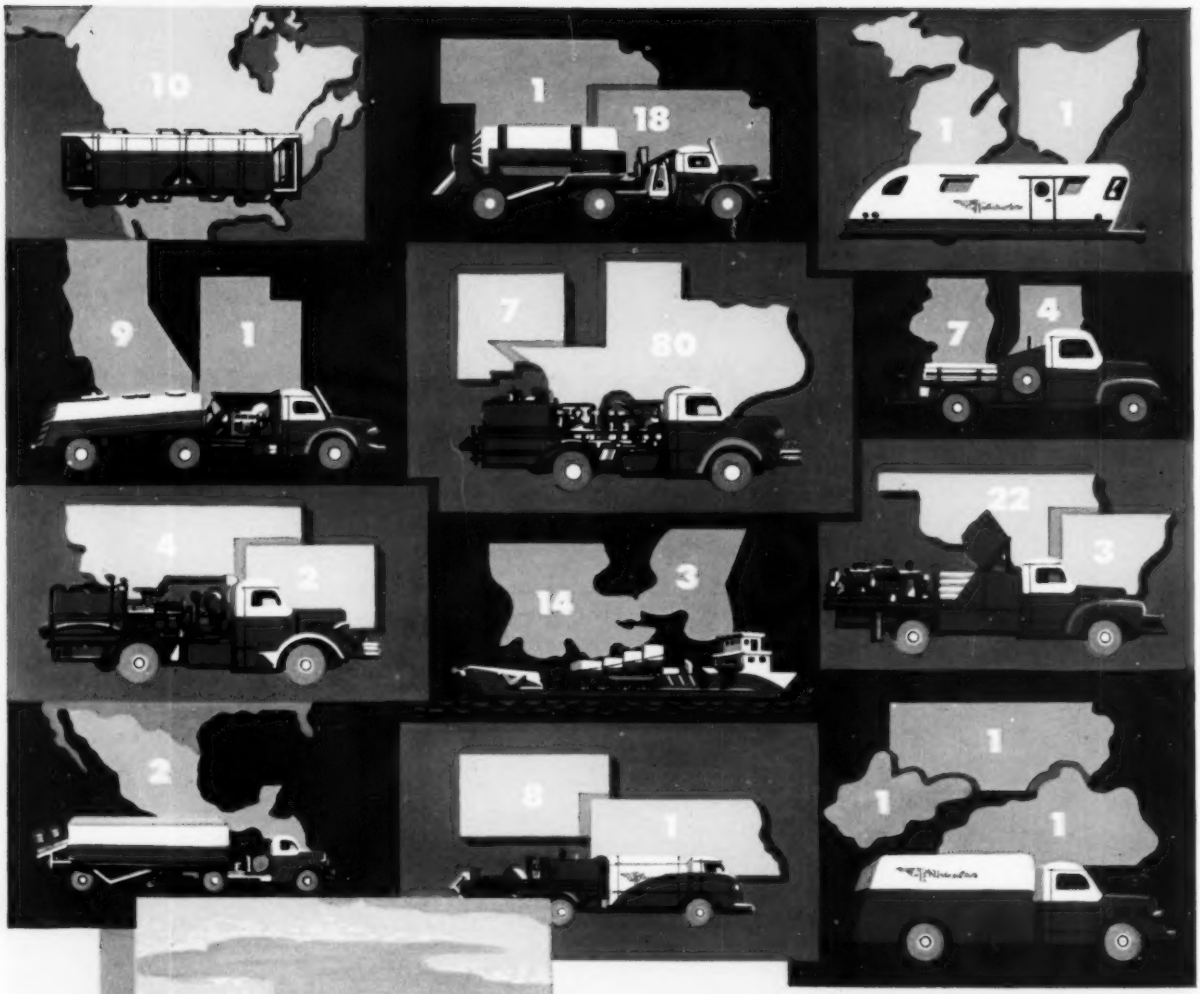

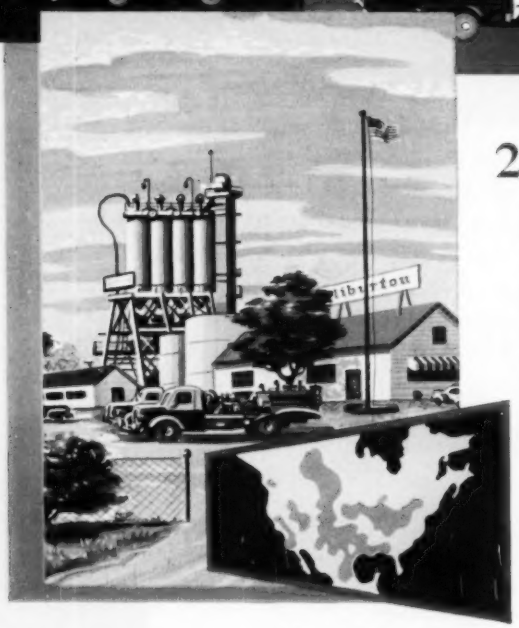

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Pitched in the midst of almost every oil patch is a complete Halliburton field camp. It's the center of service to operators in the area... strongly manned by the most experienced engineers, fully equipped with the finest tools and technology, and pledged to perform the same quality of service that has made Halliburton first in its field.

201 centers of service in the United States, Canada, and Mexico put Halliburton only minutes away from you... well worth remembering for big savings of rigtime. Being handiest is only part of it, Halliburton's best in many ways. So, make it a habit to call Halliburton first.

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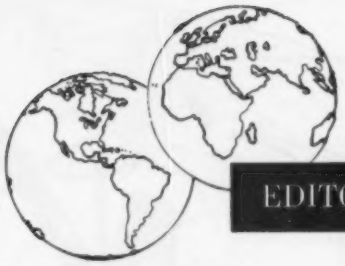


EDITORIAL

INTERNATIONAL OIL INQUISITION

WHILE AN ATTEMPT has been made to surround with something of an air of mystery the action of the Department of Justice of the United States in instituting a grand jury investigation of international oil companies, it is unlikely that the inquiry itself will reveal anything new or startling. The report on which the action is allegedly based, now released, was long classified as top secret, the reason stated being that it might impair the country's relations with friendly nations. The substance of the charges to be brought, however, has been freely discussed by the political backers of the move with the name of the companies to be pilloried.

From the statements made, it appears that the indictment is built upon time-worn charges that have been often disproved. These are in effect: that the group of companies engaged in international trade constitutes a virtual monopoly, that its members, openly or secretly, are linked in a cartel or combine to control production, fix prices, and stifle competition, that the facilities of transportation are centered in their hands, that smaller companies are excluded from the areas in which they operate and that their manipulations constitute a threat to independent producers in the United States.

These charges have been indignantly denied by responsible officials of the companies concerned who assert in unequivocal terms that they are opposed in principle to monopoly or agreements affecting prices or limiting competition. They point out that in cases of joint operation or where financial participation with other companies is involved, such agreements are submitted in advance to top ranking officials of the American government, and are entered into only after official approval.

The claim that production and distribution of international oil is largely in the hands of big companies is obviously true. Development of the oil industry in international fields has followed a course differing in certain respects from that of the domestic industry in America due to differing conditions. In the United States, ownership of the surface area extends to everything lying underneath and discovery of an oilfield of substantial extent usually means that title to its contents is divided among a rather large number of individuals. In almost all other countries, ownership of mineral rights is vested in the state or its ruler. As a consequence, concessions to exploit such resources are likely to cover large areas, even an entire country.

Since petroleum has the habit of secreting itself in places that are relatively remote and all but inaccessible, exploration and field development involves expenditures running to many millions of dollars, even to hundreds of millions. The same experience has been repeated over and over again on all six continents. Only organizations with strong financial resources can afford the risk of such investment in what are, at best, doubtful ventures.

No informed oil man needs to be told that no other industry and no other branch of the oil industry is more highly competitive than the international oil trade. Wherever conditions permit, the fight for position is carried on with great vigor. Convincing evidence of this is afforded by the huge sums poured out for exploration, drilling, providing pipe line and tanker facilities and all the equipment for wholesale and retail selling. A monopoly would find it unnecessary to spend the billions of dollars that international oil companies have laid out within the past five years in duplicating refining, storage and marketing facilities throughout the world.

A survey of conditions in all parts of the world reveals that many restrictive regulations are applied to petroleum and its products, but that, practically without exception, they are imposed by governments. These include the fixing of prices, the maintenance of state supported monopolies, the assignment of quotas, the designation of specific areas to which marketing must be confined, the limitation of products to grades lower than the companies would like to offer, and many other requirements. These practices are frequently defended on the ground that they are a protection to small operators who might otherwise be forced out of business by severe competition from stronger organizations. Not all the world is enamored of competition or shudders at mention of the word *cartel* or the thought of state control, but every government maintains the right to determine its own conditions of operation.

The international oil industry has been responsible for much of the world's progress in the past two decades. It has been the saving factor in two world wars and provides an ever increasing share of the world's energy. The prominent part played in its growth by American companies has brought to the United States the place of leadership in this field which it now enjoys. An attempt to hamper or discredit its representatives would be a disservice to the nation and to the world as a whole.

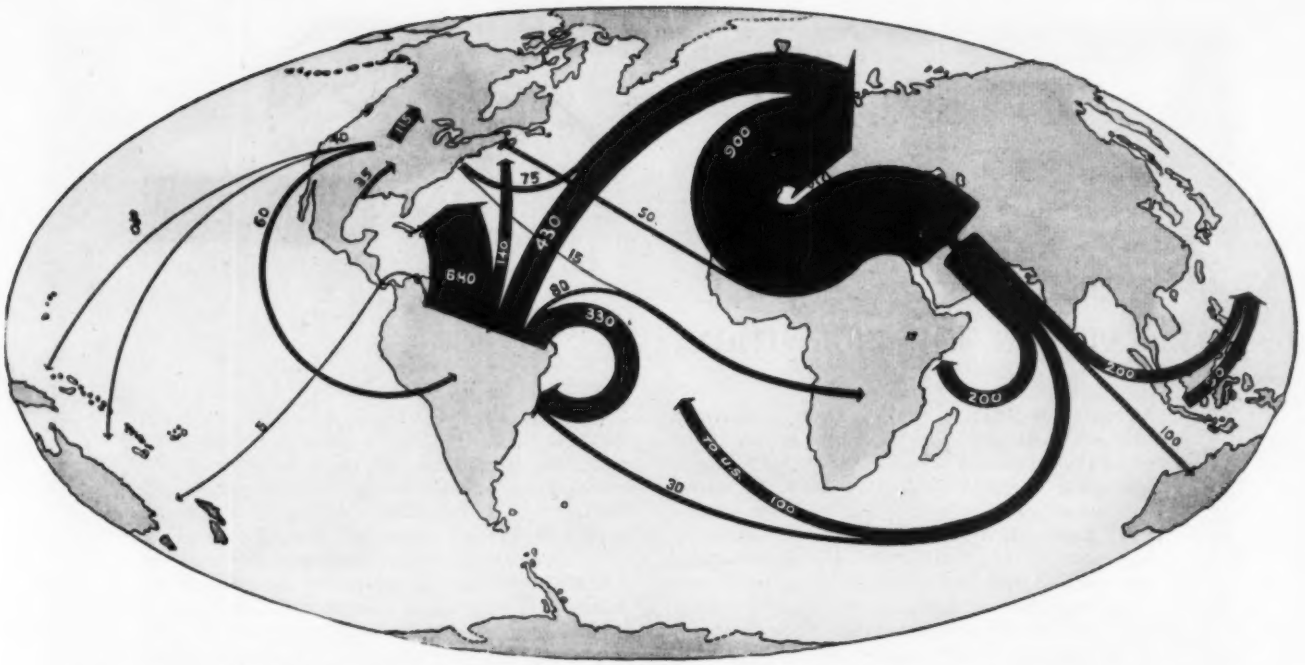


Chart indicating principal intercontinental movements of petroleum and products in 1951. Figures on the chart are in thousands of barrels daily. Arrows are not intended to indicate route followed, only origin and destination continents.

WORLD OIL CONSUMPTION UP 7.1 PERCENT

Demand for petroleum products in 1952 is expected to exceed thirteen million barrels daily. Most regions outside the United States are consuming ten percent more oil than a year ago.

WORLD CONSUMPTION of petroleum in 1952 is expected to approximate 4,855,682,000 barrels, an average of 13,025,000 barrels daily. This is an increase of 7.1 percent over the 1951 record of 12,161,000 b/d and of 18.7 percent over 1950. The estimate includes consumption of natural gasoline and other petroleum additives. Demand for crude oil is estimated at 12,300,000 b/d and of natural gasoline and related products at 725,000 b/d.

As has been the case since the close of World War II, the rate of increase in oil consumption in the Eastern Hemisphere has been greater than in the West. Reconstruction of war-torn economies plus new military operations has stimulated demand, as compared with the normal development of the Western world. In 1952 it is anticipated that the eastern half of the globe will increase its consumption by 10 percent and the remainder of the world will consume 5.8 percent more oil.

Actually the increase in South America and Canada is at the 10 percent rate being experienced in the Eastern Hemisphere. The United States is recording an increase of 4.7 percent on the basis of recent calculations of the U.S. Bureau of Mines. The volume increase in United States consumption this year will approximate 137.4 million barrels compared with 235.1 million barrels elsewhere throughout the world.

Industrial strife has had an adverse effect on oil consumption in the United States. The steel strike was particularly important because of the direct reduction in fuel consumption and collateral effects on the country's economy as a whole. The oil strike also had some effect on consumption. Indicated demand in May was 2.9 percent below May 1951. True effect of the oil strike probably was not this severe, as secondary stocks undoubtedly were drawn upon while refineries were shut down.

Supply and demand this year appear to be more nearly in balance than was the case in 1951. Last year production of crude and additives averaged 12,430,500 b/d and consumption 12,161,000 b/d. The surplus of 269,000 b/d caused a stock accumulation during the year of nearly a hundred million barrels. United States stocks of all oils rose 37 million barrels,

an average of 101,000 b/d. Canadian inventories rose an average of 22,000 b/d.

At the end of May this year, total oil stocks in the United States had been reduced 16.6 million barrels below the January 1 level, 6.1 million barrels of this being drawn from storage during May while most of the industry was idled by the strike. In that month crude output of the United States was cut 34.6 million barrels and natural gasoline 1.1 million barrels. Except for the possible effect on the ability to meet furnace oil requirements next winter, the draft on storage in the United States was not unwelcome. Gasoline reserves particularly were uncomfortably large. The industry had been finding it necessary to make very large additions to existing tankage to take care of the excess.

In the first half of the year the world has produced an average of about 11,902,000 barrels of crude oil daily, a level substantially below estimated consumption for the year. As indicated above, this was caused largely by the oil strike and provides no indication of sustained decline, but has served to correct the hundred million barrel stock accumulation of 1951.

The accompanying chart has been constructed to indicate the general flow of petroleum between the various continental areas of the world in 1951. For several years prior to 1951 the trend had been toward a smaller flow of oil from the Western Hemisphere to the east. Production in the Middle East was expanding at a more rapid rate than demand in Europe, Africa and Asia. The shutdown in Persia last year caused a reversal of this trend. In order that all consuming demands might be met, it was necessary to step up output of the industry in Venezuela to take care of the normal increase in Latin American consumption and to supply more oil to Europe.

In 1950 the Western Hemisphere had a net surplus of 242,000 barrels of oil daily to supply the east. In 1951 this was increased to 669,500 b/d. The Eastern Hemisphere had a net deficit of 255,000 b/d in 1950 which increased to 390,000 b/d in 1951. To supply the deficit, the United States increased its offshore shipments to Europe by about 50 percent to 75,500 b/d and Venezuela increased its deliveries to Europe by a similar percentage, but by the far larger volume of 150,000 b/d.

The industry shifted its supply routes with such speed that there was little disruption of retail trade in any part of the world. Some specialized products were in short supply in Southeast Asia, but this situation was corrected much more rapidly than many thought possible.

As indicated in the accompanying tabulation, the trend of increase in 1952 demand is relatively uniform by general regions outside the United States except

(Please turn to page 128)

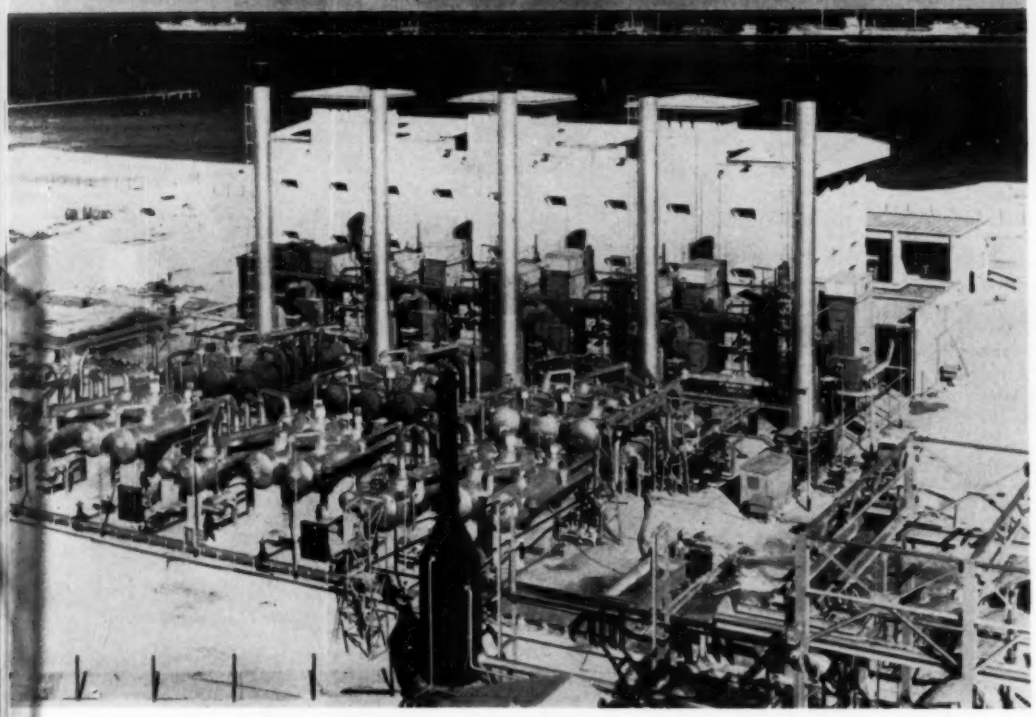
ESTIMATED WORLD CONSUMPTION OF PETROLEUM AND PRODUCTS

(Crude Equivalent Basis)
(Thousands of Barrels)

	1951		1952		
	Total	Daily Average	Total	Daily Average	Percent Change
Canada	150,200	411	166,600	455	+10.7
United States	2,566,600	7,032	2,704,000	7,388	+ 4.7
Mexico	71,200	195	87,840	204	+ 4.6
Total North America	2,788,000	7,638	2,958,440	8,047	+ 5.4
Argentina	68,620	188	75,762	207	+10.1
Brazil	40,150	110	47,214	129	+17.2
Chile	9,125	25	10,284	28	+12.5
Colombia	8,760	24	9,882	27	+ 6.7
Cuba	16,060	44	17,202	47	+ 4.8
Netherlands W. I.	53,655	147	56,364	154	+ 6.9
Peru	10,885	29	11,346	31	+ 4.5
Uruguay	8,360	22	8,418	23	+12.4
Venezuela	32,485	89	36,600	100	+10.0
Others	28 835	79	31,807	87	+10.0
Total South America & Caribbean	276,935	757	304,878	833	+10.0
TOTAL WESTERN HEMISPHERE	3,064,935	8,395	3,263,318	8,880	+ 5.8
Belgium	23,724	65	27,255	74	+13.8
Denmark	13,722	38	14,990	41	+ 7.9
Finland	4,372	12	4,565	12	—
France	89,812	246	102,002	279	+13.4
Germany, Western	38,800	106	44,269	121	+14.1
Greece	8,174	23	9,102	25	+ 8.7
Ireland	6,126	17	6,830	19	+11.8
Italy	46,534	127	51,680	141	+11.0
Netherlands	29 297	80	32,198	88	+10.0
Norway	13 304	36	14,842	40	+11.1
Portugal	10,470	29	11,189	31	+ 6.9
Spain	11,940	33	12,935	35	+ 6.1
Sweden	35,466	97	40,873	112	+15.4
Switzerland	9,707	27	10,487	29	+ 7.4
United Kingdom	148,637	407	174,849	478	+17.5
Yugoslavia	3,935	11	4,141	11	—
USSR	358,696	860	380,435	960	+11.6
Others	120,800	331	157,358	279	—15.4
Total Europe	973,514	2,545	1,100,000	2,800	+10.0
Algeria	10,476	29	11,382	31	+ 7.4
British East Africa	5,726	16	6,647	18	+12.5
Egypt	37,826	104	41,929	114	+ 9.8
Ethiopia & French Somaliland	2,618	7	3,265	9	+28.5
South Africa	26,839	74	28,509	78	+ 5.4
Tunisia	2,289	6	2,464	7	+16.7
West Africa	55,397	152	64,332	176	+15.8
Others	34,676	94	39,528	108	+14.9
Total Africa	120,450	330	133,724	365	+10.6
Aden	18,117	50	16,624	45	—10.0
Bahrein	4,339	12	5,211	14	+16.7
Iran	21,292	58	10,867	30	—48.2
Iraq	5,201	14	5,467	15	+ 7.2
Israel	6,672	18	7,496	21	+16.7
Saudi Arabia	8,383	23	9,436	26	+13.0
Syria & Lebanon	5,009	14	7,626	21	+50.0
Turkey	5,414	15	7,032	19	+26.6
Others	18,511	52	18,041	49	— 5.3
Total Middle East	93,440	256	87,800	240	— 6.3
Australia	45,075	123	50,574	138	+12.2
Ceylon	7,055	19	7,583	21	+10.5
Hong Kong	4,316	12	4,244	12	—
India	32,425	89	35,061	96	+ 7.9
Indonesia	11,284	31	14,522	40	+29.0
Japan	25,123	69	32,155	87	+26.0
Malaya	14,622	40	16,790	46	+15.0
New Zealand	9,491	26	10,867	30	+15.7
Pakistan	10,672	29	13,833	38	+38.0
Philippines	10,901	30	11,957	32	+ 6.7
South VietNam	4,039	11	5,332	15	+36.4
Thailand	2,973	8	3,690	10	+25.0
Others	53,799	148	64,232	175	+18.3
Total Far East & Oceania	231,775	635	270,840	740	+25.6
TOTAL EASTERN HEMISPHERE	1,419,179	3,766	1,592,364	4,145	+10.0
WORLD TOTAL	4,494,114	12,161	4,855,682	13,025	+ 7.1

Sea Water Evaporators at Kuwait

BY
E. LAWSON LOMAX



General view of salt water evaporator.

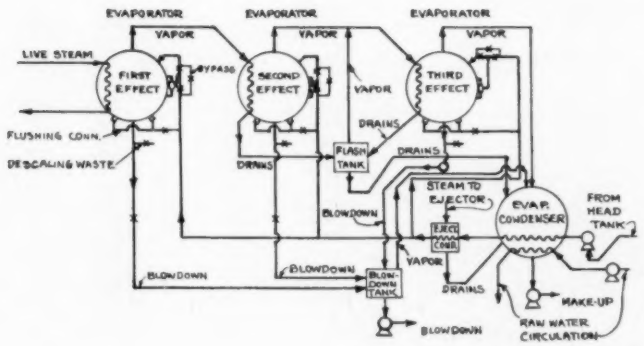


Fig. 2. Diagrammatic representation of the three-stage sea water evaporator plant.

A DEPENDABLE source of fresh water has yet to be discovered in Kuwait and the installation of a sea water evaporator plant to provide requirements of potable water was decided upon by the Kuwait Oil Company as being more economical and more reliable than the alternative of bringing supplies some 90 miles by tanker from the Shatt el Arab.

The company estimated daily needs in the neighborhood of 600,000 gallons. To provide for this, six triple-effect or three-stage sea water evaporator units, each capable of a daily output of 100,000 gallons of distilled water, were ordered from Westinghouse International Company of New York.

Heating steam for each first effect is supplied by the main steam boiler plant

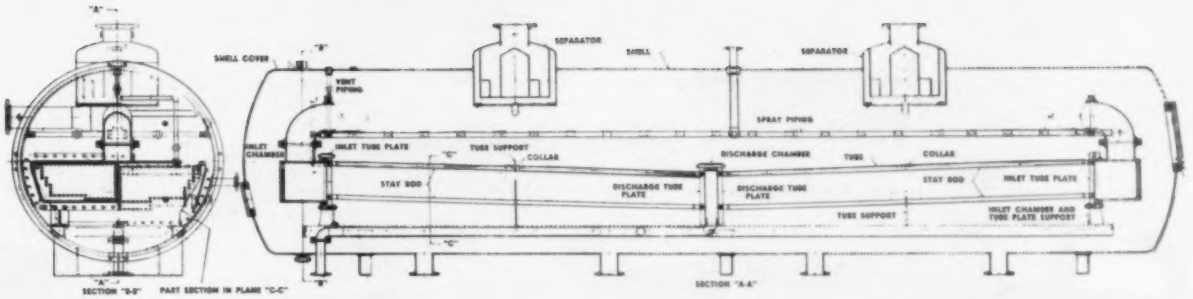


Fig. 1. Typical cross section of one of the evaporator units.

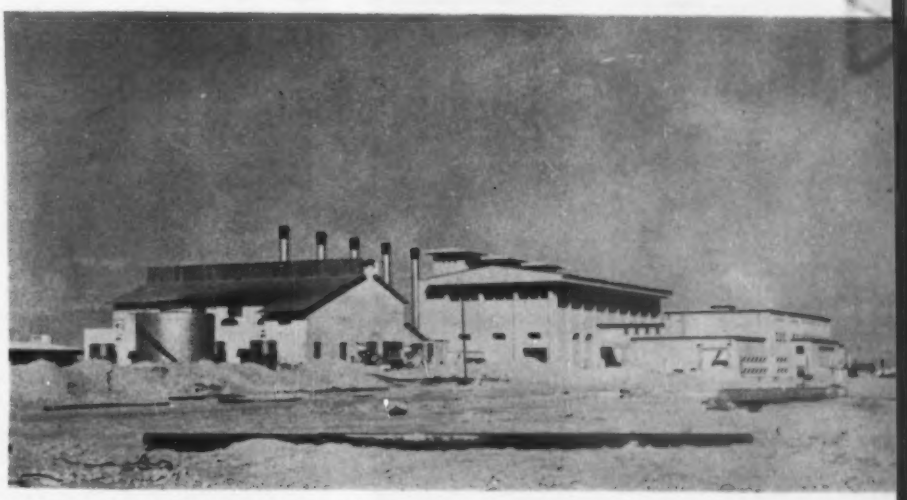
and is received in the evaporator unit as de-superated steam at five pounds per square inch, this steam being then returned to the boiler as water at 227.2°F. The heat required for evaporation in each second effect is provided by the vapor from the first effect, while the heat required for evaporation in each third effect is provided by the vapor from the second effect. The heating steam from the second and third effects is collected in a flash tank, and vapor from the flash tank is led back into the system as heating vapor for the third effect. The condensate in the flash tank is drained to the main condenser.

The incoming sea water feed is first preheated in the main condenser and then used as circulating water in the ejector condenser before being passed into each of the effects as feed water. Half of the feed in each effect is vaporized, while the other half is blown down to waste after having been collected in a flash tank, the vapor from which is led direct to the main condenser.

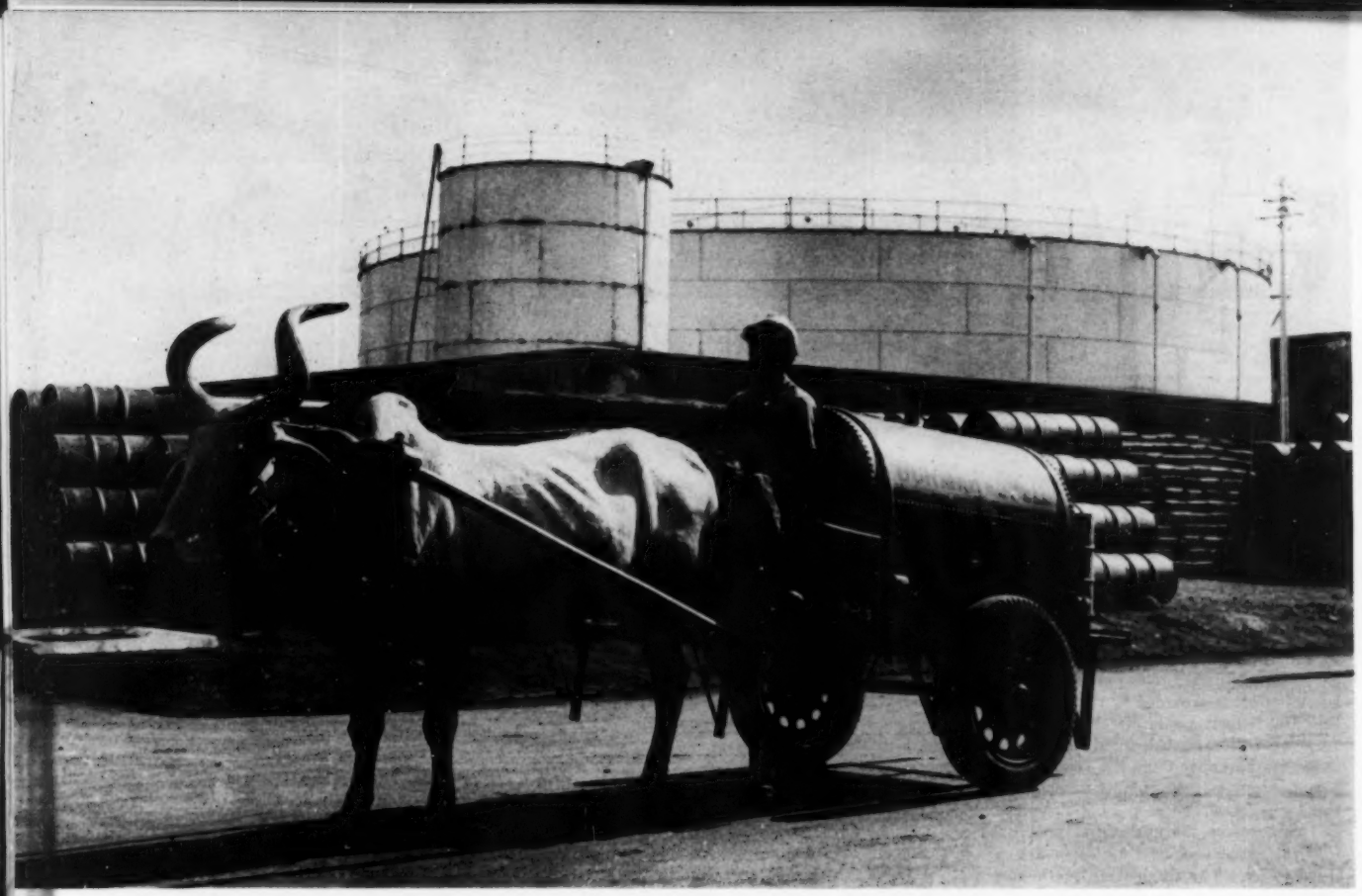
All the vapor from the third effect, together with that from the blow-down flash tank and the drains from the flash tank and the ejector condenser, is collected in the main condenser and from there pumped to surge tanks where it is mineralized by mixing with a pre-determined amount of brackish water before being pumped to the main storage. To ensure the purity of the distillate, each effect is provided with a centrifugal steam and water separator and in addition, a multi-point conductivity indicator is provided which, besides indicating the quality of the distillate, is also connected to the ejector drains and the drains from the second and third effect evaporators so that a leaky tube or carry-off from any effect can be readily traced.

Some conception of the size of the plant as a whole can be gathered from the following details: each first and second effect evaporator has a circular copper-bearing steel shell ½ inch thick, 72 inches internal diameter, and approximately 29 feet 6 inches long; each third effect evaporator is similar in shape and diameter, but is 38 feet 6 inches long. All the effects are fitted with double tube bundles and the heating surface in each of the first and second effects is 2,150 square feet, and 2,220 square feet in each third effect. The main condenser has a copper-bearing steel shell of 5 feet 1 inch diameter and 21 feet 6 inches over-all length with cast iron water boxes. The tubes of the main condenser, which are of cupro-nickel, have an active tube length of 18 feet, giving a total cooling surface of 1,600 square feet. The air ejector unit consists of a double pass condenser fitted with two single stage ejectors connected to the main condenser. The cooling medium for this condenser, as already stated, is the sea water feed to each evaporator.

Design performance data, estimated on 50 percent dirty conditions, require 17,700 pounds of steam per hour at a temperature of 227.2°F to evaporate 15,810 pounds of sea water per hour in each of the first effect evaporators; and, with an equal amount of blow-down at a temperature of 199.2°F, the heat transfer is estimated to be 17,190,000 Btu's per hour. For the second effect evaporators, 15,810 pounds of vapor at a temperature of 196.8°F from the first effect evaporators is required to evaporate 14,400 pounds of sea water per hour; with an equal amount of blow-down at a temperature of 186.8°F, the heat transfer is estimated at 15,500 Btu's per hour. For the third effect evaporators, 14,910 pounds of vapor at a temperature of 164.6°F from both the second effect evaporators and the flash tank evaporate 14,580 pounds of sea water per hour with 15,290 pounds per hour blow-down. The total quantity passing to the condenser then is 45,985 pounds per hour, which includes the vapors from the third effect evaporator and the blow-down flash tank together with the drains from the flash tank and the ejector condenser. Thus, for 17,700 pounds of heating steam, plus 485 pounds of steam required by the ejector, 45,985 pounds of distillate are obtained, which is equivalent to 2.53 pounds of distillate per pound of steam.



Salt water plant looking inward from seashore.



The oxcart still is widely used for the transport of oil products in India because of poor roads. Scene is at Burmah-Shell's Bombay installation.

BURMAH-SHELL LAUNCHES BROAD EXPANSION IN INDIA

BURMAH-SHELL has launched a multi-million dollar expansion program in India to meet the steady increase in demand for oil products anticipated under the government's plan for industrial development. New depots, ocean installations, pipe lines, bunkering stations, service stations and gasoline pump sites and additional distribution facilities are already under way. Further projects are in the blue-print stage, ready to be put into operation as the need arises.

At the same time the Shell and Burmah groups are forming a new company to be incorporated in India, Burmah-Shell Refineries Ltd., for the erection and operation of a refinery near Bombay. Work on this new two million ton refinery is progressing rapidly. Both the aerial survey of the Trombay Island site eight miles north of Bombay and the sub-surface exploration phase have been completed. Results are now being correlated to determine the most suitable position in the 600-acre area. Designing of the refinery itself is under way in London and The Hague.

Government of India surveyor at work on Trombay Island, Bombay harbor, where Burmah-Shell's new 40,000-barrel refinery will be built.

The refinery will be the largest of the three planned for India as a result of discussions concluded last December with the government by Burmah-Shell, Standard Vacuum and Caltex. Originally, capacity was to have been 1½ million tons per year, but Burmah-Shell announced several months ago that capacity would be increased to two million tons. The decision, coming as it did soon after the outcome of the Indian election was made known, can be regarded as a further indication of confidence in the country's future.

The election showed that Communist sympathizers are not lacking, particularly in Hyderabad, Cochin and Travancore, but the demonstration that the majority of the population is still solidly in favor of the Congress party has confirmed the hope that India is safely launched on a period of political stability.

Equally significant is the reaction of the Indian press and public to the government's new policy of encouraging foreign investment. While a small section maintains that control of the refinery should be more in Indian hands, the vast majority has accepted the oil agreement wholeheartedly. This indicates that along with top level government officials, the public in general has recognized the benefits to accrue and has reached a new milestone in political maturity.

Burmah-Shell is preparing to build two new ocean terminals, one at Kundla on the northwest coast near the Pakistan border, and the other at Vishakapatnam on the east coast, midway between Madras and Calcutta. The new installations will bring the total owned by the company to eight. Cost is estimated at several million dollars.

Another coastal improvement underway is the construction of a half million dollar pipe line at Cochin harbor in the southwest. It will be 2½ miles long, connecting the end of a new jetty being erected by the government to the company's installations. When completed, the pipe line will eliminate the cumbersome use of a large barge fleet which now transports oil products from tankers anchored to buoys in the harbor to the shore.

Burmah-Shell recently completed a new bunkering station in Bombay harbor. This is the first built in India specifically for small power-driven fishing craft. Another large bunkering station for use by ocean-going vessels is to be built at Cochin harbor.

To expedite marketing of oil products in the interior, Burmah-Shell has opened four new divisional stations in the past three years. These are at Bangalore, Puri, Ahmedabad and Rajkot. New sales outlets are being developed throughout the country and existing ones enlarged. Depots are being swiftly added to the total of 793 already in existence. An example of the foresight being exercised by the company is the recent establishment of the new divisional office at Puri in the Calcutta area. The Puri section is expected to develop in the next few years and require additional petroleum products.

Burmah-Shell is the largest oil marketing and distributing company in India, servicing roughly two thirds of the market. The company was formed in 1928 to take over the two storage, distributing and marketing organizations then separately operating throughout most of India under the names of the Burmah Oil Co. and the Asiatic Petroleum Co. (India) Ltd. The company now has 16,000 employees, seven installations, 21 divisional offices, 793 depots, 375 lorries, and four-gallon container manufacturing factories in six centers. Headquarters are in Bombay under J. R. C. Taylor, general manager.

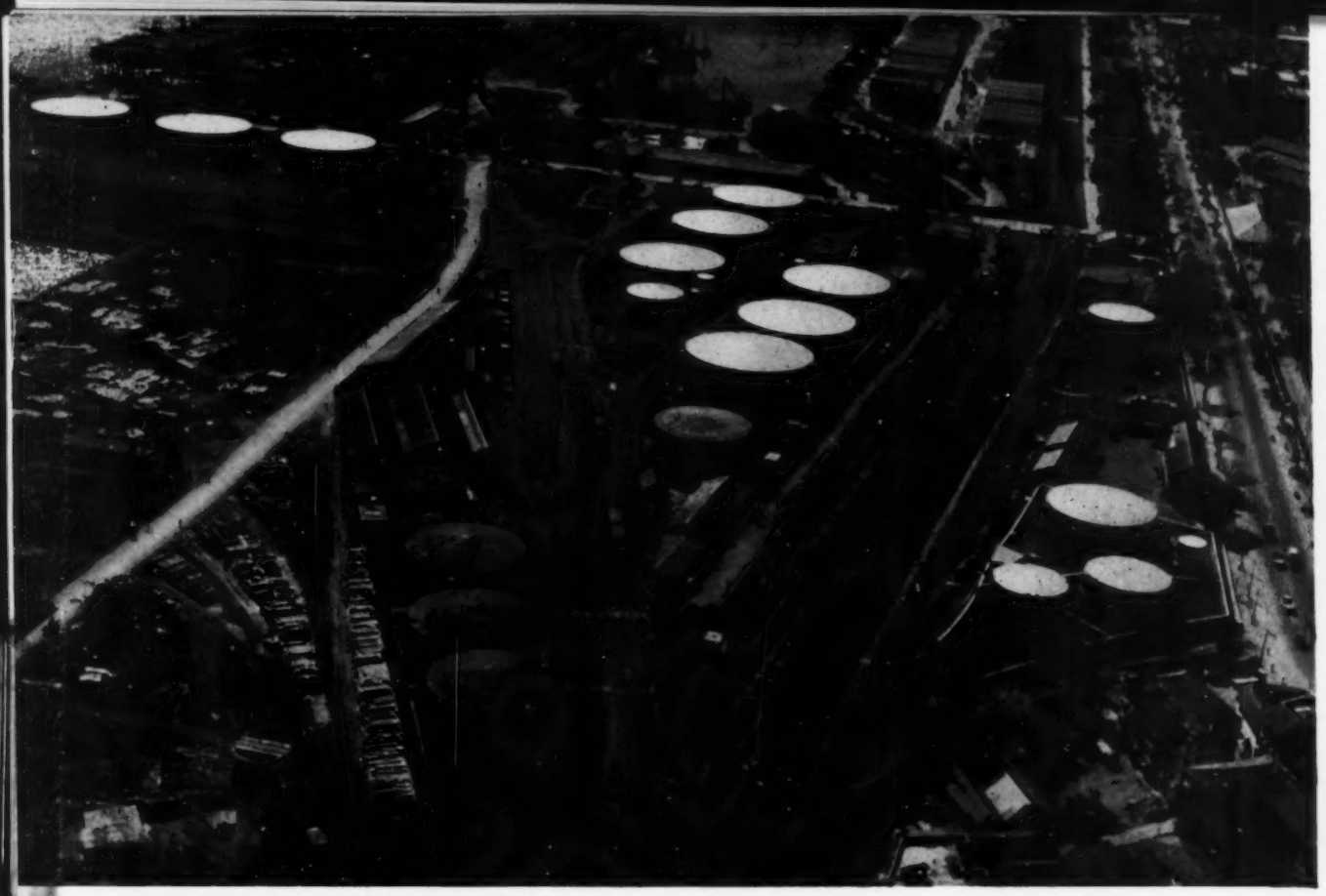
A major handicap in the distribution of oil products has been India's poor roads. In 1929, Burmah-Shell sponsored formation of the Indian Roads and Transport Development Association. This organization is still operating with headquarters in Bombay and among other duties acts as consultant to the government in transportation matters. In 1946/47 it helped draw up the Nagpur plan under which 450,000 crores of rupees were to be spent on building new roads and improving existing ones. Relatively little progress, however, was made in carrying out the plan due to lack of capital.

The new five-year plan, however, encompasses another road development project. Although a substantially smaller sum is to be expended, this blueprint is regarded as more realistic.

Other current improvements by Bur-

Contrasting with handling methods outside the installation is this fork-lifting machine in service at Burmah-Shell's Sewree plant at Bombay.

Loading kerosine on a small fishing craft at Bombay for delivery up the coast. Such points are stocked before the June-November monsoon season during which they are inaccessible.

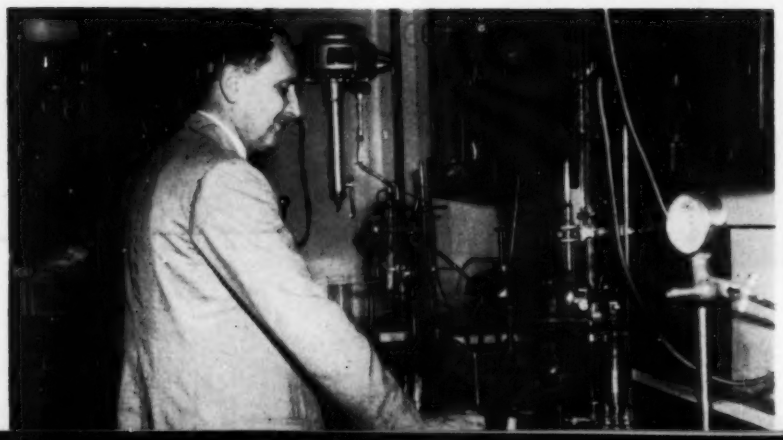


Burmah-Shell's Sewree installation at Bombay.

O. M. Ilbert, Burmah-Shell resident assistant, left, confers with G. Jenkins, industrial training assistant, and P. Govindarkrishnayva, assistant in charge of technical training.

mah-Shell include a technical laboratory opened in the Bombay office in January. Believed to be the most up to date in the country, it is operated by two highly skilled Indian chemists who test and analyze samples sent in by customers and advise as to the condition of the engine in which the oil is used as well as estimate the further life of the engine.

Burmah-Shell has also inaugurated a new fueling service designed specifically for the British Overseas Airlines jet Comets. The plan has been designed for "integral" pressure fueling and the company is providing two 3,000-gallon capacity "Dorset" fuelers at both Bombay and Calcutta to operate in pairs and give a total delivery speed of 400 gallons per minute. Integral fueling is a new departure for land planes. It is possible to complete the fueling of the Comet, which has a 6,000-gallon capacity, without the necessity for the fueling crew to leave the ground or climb onto any part of the aircraft.



I. W. H. Sitwell, acting branch manager at Bombay, in the new Burmah-Shell technical laboratory.

India's 3¼ million ton consumption of oil products in 1951 is small by western standards, but the post-war period increase has exceeded all expectations. One of the most interesting developments has been the rise in kerosine consumption.

In 1939, when sales of this product in undivided India reached just over 800,000 tons, it was believed demand had reached its peak. Yet in 1951 consumption in the Indian Union alone was 1,000,000 tons. This has been partly due to the increase in population and general development of the country, but has been helped by the increase in price of vegetable oils. As a result, the majority of the population, the agriculturists, have found it more profitable to sell vegetable oils and use the cheaper kerosine for illumination.

India now uses more kerosine than any other country in the world, and this product is the largest single item in her total oil consumption. The development of hydroelectric generating stations may eventually reduce the amount, but a still further rise is anticipated over the next few years.

The most significant development, however, has been the increase in use of high speed diesel oil. In 1939, consumption in united India was 9,000 tons. In 1951 the Indian Union consumed 260,000 tons. This indicates the progress made thus far in the mechanization of agriculture and the development of diesel traction machinery in the country. Yet, while the aid of the machine is invoked more and more in industrial production, it still plays only a relatively small part in Indian agriculture.

As far back as 1930, Burmah-Shell foresaw that the country's economy would remain predominantly agricultural, and that mechanized farming had a great future despite small land holdings and other handicaps. Unnoticed by the world outside, the company at that early date pioneered tractor demonstrations and experimental power plowing projects to encourage mechanization.

Last year, India's imports of tractors exceeded 5,000 but the number in use is still insignificant in relation to the country's 234 million overburdened acres at present under cultivation.

The five-year plan allots $200 million to the whole field of industry and it is hoped and believed that private enterprise will play a dominant part in this development. Nearly half the total expenditure is to be devoted to agricultural development. New dollar appropriations from the United States and sterling balances released from the United Kingdom under the Colombo plan will give considerable impetus to the country's battle against hunger.

Burmah-Shell is now stepping up the educational phase of its operations. The company has made available to educational institutions and other interested groups some 90 different 16mm films. Plans are now afoot to inaugurate traveling cinema vans to bring these films to villages throughout India as well as the larger centers where they are now shown. The company has opened a new training school on the Trombay Island site. Three-week courses for 12 students at a time started recently. The company has also set up two scholarships to be granted each year to Indian nationals for technical study in England.

Verandah of new Burmah-Shell training school recently opened on Trombay Island.

When the Bombay refineries have been put in operation, India will be able to make substantial savings in foreign exchange. Also, because crude oil probably will come from Middle Eastern sources, the finished products of the refinery should prove cheaper than imported products brought from far distant supply sources.

During the post-war period and until early this year, prices of oil products in India remained relatively stable. Until Abadan closed down, about three quarters of India's needs reached the country from Persia and other mid-east sources. With the closure of Abadan, supplies have had to come from numerous other sources, most of them many thousands of miles from India and all involving higher ocean freights. These charges have had to be recovered and the Indian government, in consultation with the oil industry, has decided upon price increases which have affected some products more severely than others.

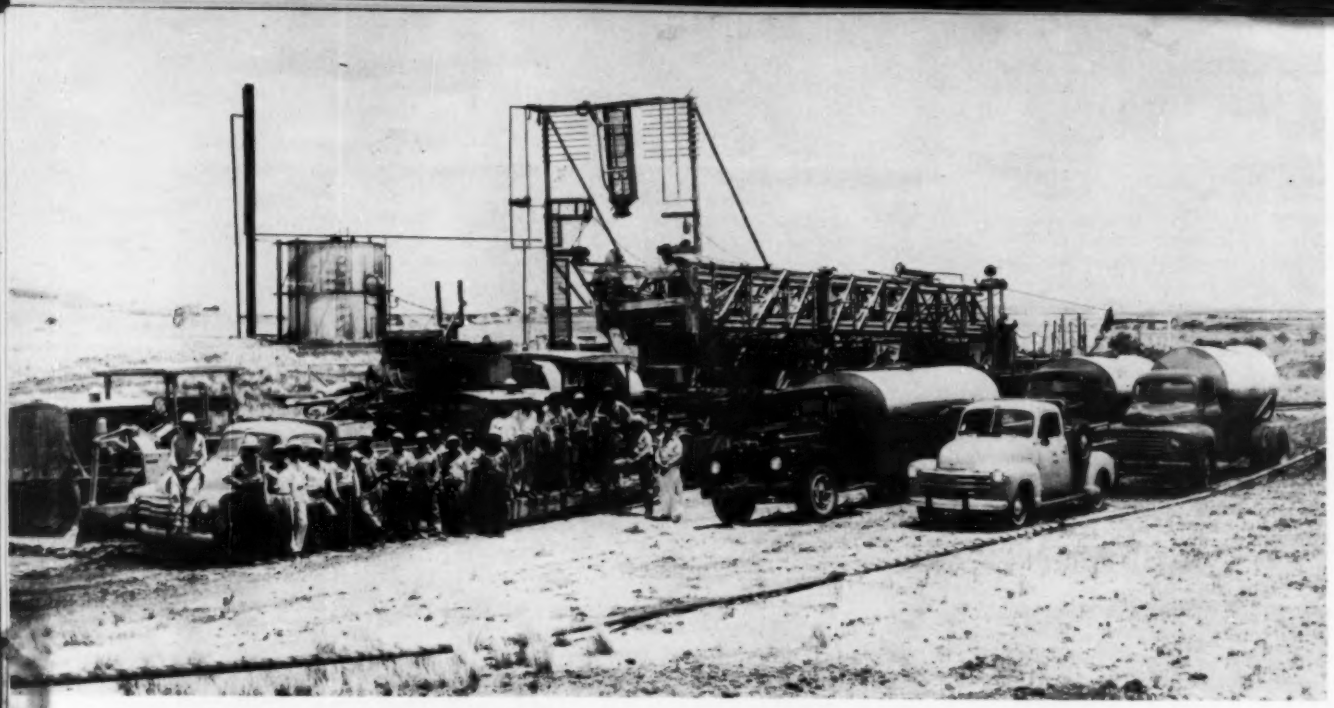
The fuel oils were the products most affected and early this year their prices were increased considerably; kerosine for the poor man's lantern and gasoline for the country's transport have gone up in price, but by relatively small amounts. It is to be expected that when the refineries have been built and import of crude oil starts, prices should come down. This would serve as a considerable shot in the arm to the country's expanding economy.

INDIA'S LIQUID FUEL CONSUMPTION

(Tons of 2,240 Pounds)

	1939*	1948**	1949**	1950**	1951**
Motor Gas	332,000	450,000	516,000	572,000	777,000
Kerosine	832,000	534,000	697,000	848,000	1,001,000
Power Karosine	———	10,000	32,000	36,000	29,000
Gas Oil	9,000	63,000	155,000	176,000	260,000
Diesel Oil	265,000	272,000	334,000	315,000	385,000
Fuel Oil	257,000	486,000	547,000	560,000	603,000

* Undivided India ** Independent India



One of Mene Grande's structure-drill rigs with its auxiliary equipment. Picture taken at tour change shows two crews, all Venezuelans except the toolpushers.

LOW COST

One of the "200" rigs that drilled 2,000,000 feet of hole for Mene Grande.

Most of Mene Grande's structure-drill equipment is mounted on tracks for cross-country moving.

STRUCTURE-DRILL PROGRAM

increases Mene Grande wildcat success record

By Neal Van Middlesworth

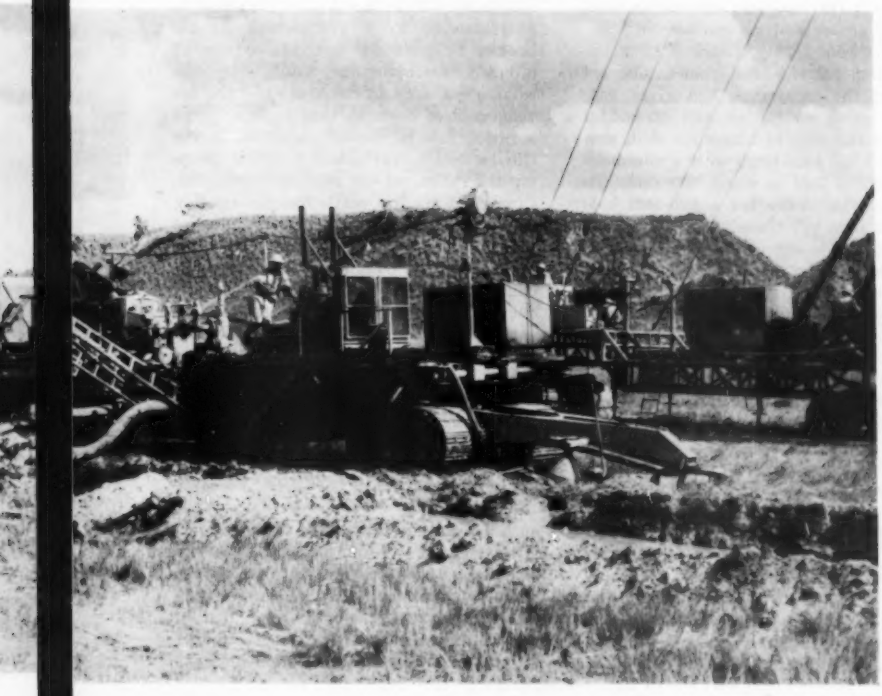
THE MENE GRANDE OIL COMPANY, a Gulf Oil Corporation subsidiary, operates a structure-drill program in Eastern Venezuela which is unique for that country and may not have its counterpart elsewhere in the world. This program accounted for the drilling and electrical logging of nearly 4,800,000 feet of hole, or over 900 miles, from its inception in 1939 to the end of May 1952. Record footage was made in 1946, when 700,831 feet were drilled. There were three rigs in fairly constant operation that year.

Greatest rig productivity was accomplished last year, when with only one rig in the field at a time, the year's total footage was 359,499, an average of 1,185 feet of hole per rig work day, Sundays and holidays excluded. This includes the time spent in moving, running an electrical log at each location, and in making field repairs. To do this 128 holes were drilled to an average depth of 2,809 feet. And 1952 promises to be a still bigger year, with one rig accounting for 167,626 feet through May, 1,330 feet per work day. At this rate the year's production should top 400,000 feet.

Mene Grande considers that its structure drill program, operated in close conjunction with a reflection - seismograph shooting program, has been one of the most vital factors in the exploration and development of the Greater Oficina area, where 225,000 barrels of production has been built up since 1936. From 1939 to the end of 1951 Meneg drilled 79 wildcats in Greater Oficina, practically all of them on locations checked previously with structure drill. Of the 79 wildcats, only 23 were dry or non-commercial, a phenomenal success ratio of 70 percent.

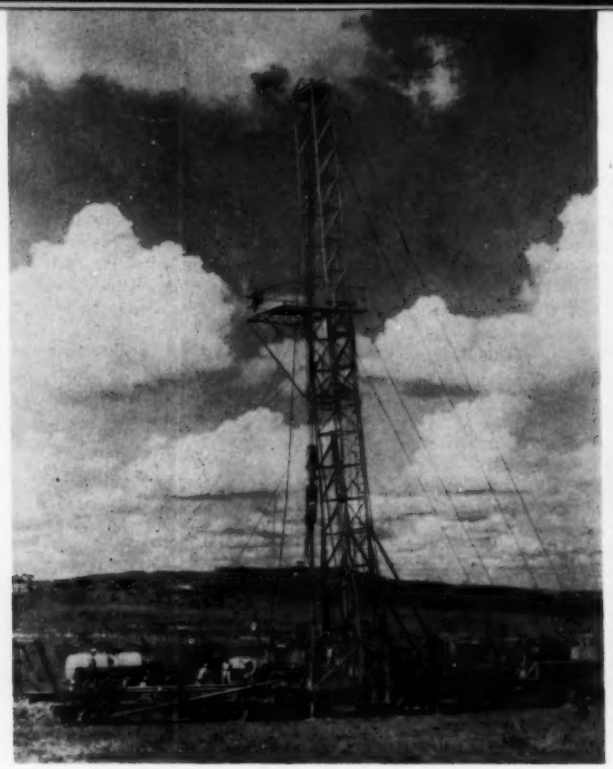
Mene Grande policy has been to cover an area first with reflection seismograph and then check with structure drill the various fault features indicated by two sets of interpretations, one furnished locally by party interpreters, and a second by Gulf Research & Development Corp. The interpretations occasionally show considerable disagreement on strike and dip of the all-important faults. The structure drill work, which more precisely locates the faults, furnishes unquestionable information on the dip of the faults, and occasionally locates faults not delineated by seismograph. The drilling record is usually furnished to Gulf Research for review.

This system has proved most beneficial to Mene Grande's wildcat drilling, as indicated by the small percentage of dry holes even though the lateral extent of the fields back from the controlling fault is limited in most cases. The build-up of information under this policy is of course utilized for a great deal more than locating the original wildcat and is in fact used through a considerable portion of the exploitation of any one field. It is finally superseded by the more accurate information available from closely spaced deep wells, in which accumulation discrepancies are also a large factor in obtaining the final interpretation of the structure.



The earliest wildcat locations in Greater Oficina were based on refraction seismograph data supplemented in some cases by a few torsion-balance lines. Detailed refraction-seismograph work was done in much of the area during 1936-37-38, but the results of this shooting, as interpreted at the time, show little accordance with structure as it is now known. A magnetic survey in 1937 brought out pronounced east-west trends in the basement, but the magnetic picture has not yet been clearly enough correlated with sedimentary structure to have furnished much help in discovering oil accumulations.

Coverage of the whole area with a detailed grid of gravimeter work in 1940 likewise failed to yield results having much practical application to date. Soil analysis and surface electrical prospecting have been tried, but their results cannot yet be conclusively evaluated. Surface geological work has given important leads, but at best has been able to afford only very vague indications of subsurface structure.



Structure drill unit on location. Note the relatively level nature of the terrain.

Close up of light "200" rig at work.

Reflection-seismograph work and structure drilling were both initiated in 1939 and have been continued with more and more emphasis to the present time. Continued improvements in both these methods as regards technique of operation and interpretation have resulted in their firm establishment as essential prerequisites to exploration drilling in this area. Reflection-seismograph work allows fairly accurate contouring on phantom horizons within individual fault segments by the continuous-profile method, and is commonly successful in locating faults which are critically important in oil accumulation in this area.

Structure drilling with portable rigs of 1,000 to 3,000-foot depth capacity, with reliance on electrical logging (rather than cores) for correlation, has provided still more positive means of determining structure, although with the limitation of working at horizons several thousand feet above the producing sands.

The combination of closely coordinated reflection-seismograph and structure-drill work constitutes the most effective exploration method developed in this region.

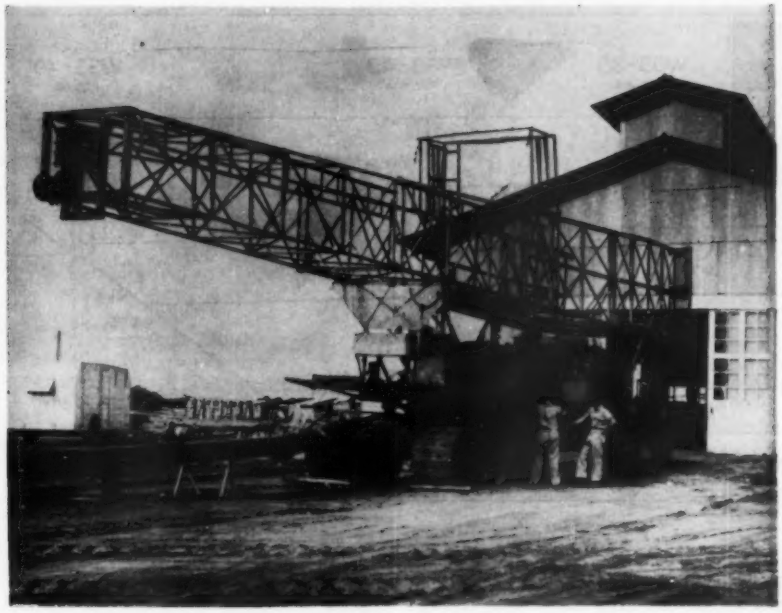
Mene Grande's present structure-drill program was evolved from what was originally conceived as a core-drill program. On the first project cores were taken. On the second project, in 1939, the possibility of correlating core holes by electric logging was suggested, and Schlumberger surveys were made in two holes. Although one of the surveys reached a depth of only 100 feet, excellent correlation was obtained between the two holes 1,600 feet apart. Schlumberger logging was again resorted to on Project 3, in an effort to speed up the work. Twelve holes were surveyed to depths of 500-600 feet and at distances of from 3,200 to 10,000 feet apart. In all cases, the logs gave excellent correlation and provided accurate structural control.

Shallow-hole coring, followed by lithologic, mineralogic and paleontological study of the recoveries, had given reasonably good correlation and structural data. In the area in which the drill was then working, four tours were a minimum for coring a hole to about 500 feet. To drill and electrically log a 500-foot hole took less than two tours. The electric log gave a complete and continuous record of each hole, whereas the core record was intermittent. Core recoveries were averaging 68 percent and frequently the most important correlation marker was being lost.

There was no comparison between the amounts of labor involved in the relatively simple matching of peaks on the electric log and the lengthy processes involved in correlating cored sections, which involved the making of core descriptions, transportation and storage of cores, sample washing, and the other tedious and time-consuming preliminaries to detailed mineralogic and paleontological study. Furthermore, correlation of electric logs in the field permitted the use of data from one hole in making the location and depth program for the next hole, whereas core study necessarily lagged several days behind the drill.

The Greater Oficina area occupies a part of the broad, grass-covered sandy plain of Eastern Venezuela commonly known as the "mesa," most of which is covered by a nearly horizontal blanket of Quaternary Mesa formation. Structure is characterized by a gentle regional dip broken by a rather intricate system of laterally discontinuous faults. It was established early in the history of the development of the area that faulting plays a major role in the accumulation in the Oficina field by furnishing barriers to up-dip migration on the regional homocline. Cross-faulting and gentle folding trending across the regional strike also influence accumulation behind the larger faults. In addition to the dominantly structural accumulation, a certain proportion of production is due primarily to stratigraphic variation in the permeability of individual sands or actual pinching out of sand strata up-dip.

The structure-drill program was made possible by two related facts which were soon discovered, first that reliable electrical markers could be found within the drilling depth limits of portable drills (1,000 to 3,000 feet), and second that such markers accurately reflected underlying structure in the vicinity of the oil horizons (6,000-7,000 feet). An early review of all available shallow electric runs on wells in the Oficina field resulted in the identification in every well section of several widely continuous marker horizons



The shop-made "400" rig, designed and built by Mene Grande's head toolpusher during the war from materials at hand.

at relatively shallow depths. Structure was essentially that of lower horizons in the producing section, except as displaced by the moderately low-angle faulting of the field. With these facts in hand, Mene Grande's structure-drill program was launched.

The accompanying partial cross section of the West Guara field shows an almost perfectly regular expression of one of the early important structure-drill horizons, the "Rho," in this case extending over a distance of 1,250 yards, from well WGG-48 to WGS-49, and across a fault.

The equipment, personnel and operation of the structure drill or drills are all directly under the control of the geological department, since one of their functions is exploration. Areas to be worked are assigned by the chief geologist in Caracas. The division geologist at San Tome, who supervises the programs since most of them are carried out in the area of his jurisdiction, has authority to modify the program in line with needs which become apparent in the progress of the work. In this way, fill-in work may be done before the equipment gets far away.

The head toolpusher and an interpretation geologist, both based at the San Tome production camp, are responsible to the division geologist. The geologist, in addition to interpretation, supervises the engineer who surveys the locations. The head toolpusher plans and is directly responsible for all field operations except the surveying.

Mene Grande is fortunate in the kind of terrain over which these operations are carried out. The mesa of central Anzoategui is flat or gently rolling, with sparse vegetation and few stream beds. Direct cross-country moving without benefit of roads is generally fairly easy to accomplish, except during the rainy season. This topographical advantage has made it feasible to place much of the equipment on tracked trailers, which are hauled three or four at a time by the assigned tractors. No figures are available on moving time, as this depends upon such variables as distance between locations, terrain and weather. However, under favorable conditions it is possible for one tour to come out of the hole, run the electric log, move to the next location and begin drilling before the tour changes. Such equipment as has had to be removed from the trailers is loaded back during the logging operation.

Except for the earliest months of operation, when holes were relatively few, the structure drill parties have, by special agreement with Schlumberger, had men and equipment especially assigned to the rig. This has kept waiting time at a minimum. Incidentally, 30 to 40 feet of surface casing, run to prevent loss of circulation to the huge ant tunnels frequently encountered on the mesa, provides an excellent ground for the Schlumberger contacts.

In the course of drilling nearly 4.8 million feet, Mene Grande has used a total of five rigs. The service records of the five are shown in Table I. Table II gives more detail on the performance of the individual rigs.

As Table I shows, the workhorses of the program to date have been the "200A" and the "400" outfits, each with over a million and a quarter feet of hole to its credit. Their construction and operation may be considered representative of the two principal kinds of rig used by Meneg for depths less than 2,000 feet and depths over 2,000 feet, respectively.

The "200" rigs were Sullivan No. 41 drills, adapted in Meneg's structure-drill shop (also operated by the geological department), so as to be approximately the same size as the true Sullivan Model 200.

TABLE I

DRILLING RECORD OF STRUCTURE RIGS

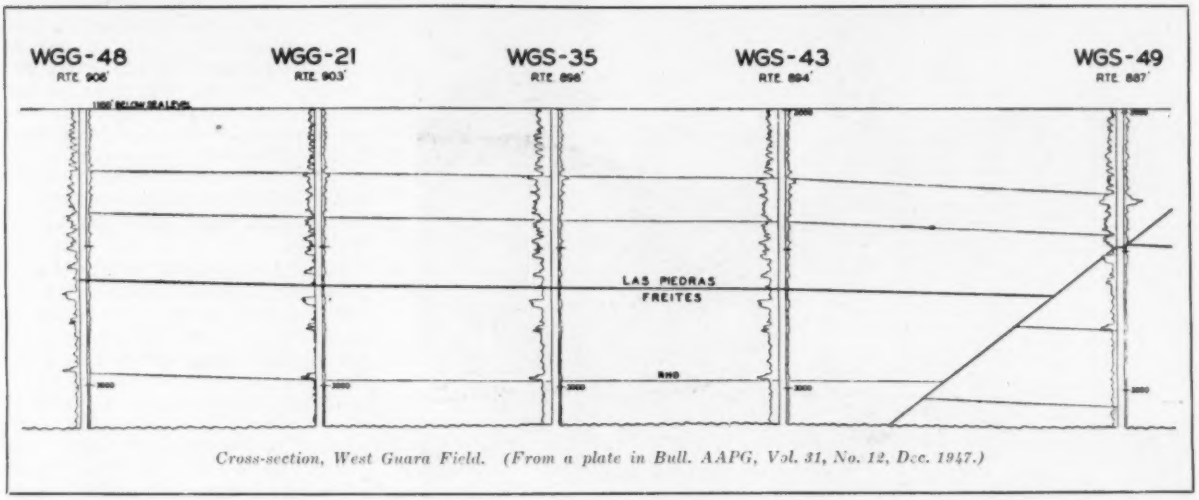
Rig Number	Placed in Service	Laid Down	Total Holes	Average Depth	Total Footage
37	Jan. 1939*	——	359	1,122	402,969
40	Dec. 1941	Dec. 1943	263	1,017	267,588
200A	Feb. 1942	Mar. 1949	853	1,436	1,224,995
400	Aug. 1953	——	549	2,471	1,356,833
200B	June 1945	Mar. 1949	611	1,399	854,696
500	Aug. 1948	——	186	2,778	516,670
			2,821	1,639	4,623,751
					875.7 miles

* Rebuilt to Rig 40

TABLE II

ANALYSIS OF RIG PERFORMANCE

		200A		200B		400		500	
Years	Days Worked	Av. Days Per Hole	Av. Feet Per Day	Av. Days Per Hole	Av. Feet Per Day	Av. Days Per Hole	Av. Feet Per Day	Av. Days Per Hole	Av. Feet Per Day
1946	354	1.81	775	2.05	687	5.21	517	——	——
1947	343	2.42	598	1.92	752	6.13	466	——	——
1948	304	2.81	482	2.41	581	3.34	695	4.61	565
1949	329	2.07	585	1.93	666	6.33	400	5.31	487
1950	296	1.89	558	2.18	643	4.20	706	3.66	783
1951	304	——	——	——	——	2.27	1177	2.55	1190



Cross-section, West Guara Field. (From a plate in Bull. AAPG, Vol. 31, No. 12, Dec. 1947.)

The principal changes made locally were: (1) Caterpillar Diesel engines replaced the 100-hp gasoline engines that originally powered the mud pump and drawworks; (2) the derrick was reinforced and 10 feet added to its 30-foot length; (3) the entire rig was placed on an Athey cleat-track trailer with 24-inch tracks. Capacity was 2,000-plus feet of 5¾ inch hole. The mounted unit weighed 20 tons.

The "200" rigs were operated together as a single party. With each one as auxiliary equipment was: (1) drill-system trailer, 20 x 6 feet, weighing 10 tons loaded with 2,500 feet of 2⅞ inch drill stem; (2) drilling-mud and fuel trailer, also 20 x 6, weighing 10 tons with 1,000 gallons of fuel and 50 sacks of mud.

Assigned to both rigs was a single D-8 Caterpillar tractor with bulldozer, which kept busy moving equipment and making roads. In addition, a contractor furnished two 1,000-gallon water trucks and one 4½ x 6 Gardner-Denver pump mounted on a light truck chassis.

The "400" rig, which is now used alternately with a "500" capable of about the same performance but weighing 25 percent less, was designed by Meneg's head structure-drill toolpusher and built during World War II under his supervision in the geological department's shop. The "400" designation was applied to this home-made outfit because of the fact that it was roughly twice as big as the so-called "200" rigs.

Considerable skill and ingenuity went into the building of this rig, which was undertaken at a time (1943) when it was impossible to get much in the way of materials from the United States. The hydraulic rams which raise the 60-foot mast, for instance, were salvaged from 15-ton HugLugger dump trucks. Another interesting point is that the Caterpillar D-8800 engine used to power the hoisting drum is not allowed to operate at peak power, but is underpowered by 20 percent so that the engine will stall before overloading can damage hoisting drum or rotary table. Using 2⅞-inch drill stem, a 6¾-inch hole is started below the 30 to 40 feet of surface pipe, and run about 1,000 feet before changing bits. The second bit, a 6½-inch, is run for about 1,000 feet, and the hole is then finished with a 6-inch bit. This stepping down of bit sizes eliminates the necessity of running reamers behind the bit. This outfit, mounted on a 45 x 10-foot Athey cleat-track, truss-wheel trailer, weighs 62 tons. Its depth capacity is 3,500 feet, while that of the factory-built Cardwell is 6,000 feet.

Auxiliary equipment used with this shop-made "400" rig includes a 7¼ x 10 Gardner-Denver Duplex slush pump, with a D - 13,000 Caterpillar diesel as prime mover, both mounted on a shop-built, specially designed trailer on tracks. The unit weighs 11 tons. The two front tracks have a fifth wheel atop, which allows towing by tractor; alternatively the two front track units can be detached and the pump towed by a truck. The transmission of the Caterpillar engine is connected with the flywheel of the pump by twelve 1 x 48-inch V-belts. A point of interest here is that the V-belt drive is equipped with a floating idler pulley for maintenance of tension. This was an innovation of the toolpusher's design which engineers predicted would not work. Nevertheless, V-belts on this unit work fine and outlast by 50 percent V-belts without idler pulleys on similar units operating under similar conditions.

A drill-stem and fuel trailer, on an 8 x 30-foot platform with Athey tracks, remains hooked to the rear of the drill at all times, so that drill and drill-stem trailer are really one unit. The trailer weighs 26 tons loaded.

Another trailer for drilling mud and spare parts, 8 x 20 feet and weighing eight tons loaded, mounted on rubber tires, is towed from location to location by one of the water trucks.

Water supply is furnished by a 3,000-gallon tank mounted on a 15-ton Hug-Lugger, a 1,800-gallon tank on a 12-ton Mack, and a 1,600 gallon tank also on a 12-ton Mack.

A D-8 Caterpillar tractor with a La Plante-Choate bulldozer completes the party. This unit moves the drill and auxiliary equipment, builds roads, and dozes out and fills slush pits.

Not the least remarkable feature of Mene Grande's structure drill program has been its low cost. The two Sullivan "200" rigs, for instance, were in operation a total of 3,698 rig days including repair time, during which time 1,375 structure holes were drilled to an average of 1,429 feet at an overall rate of 531.2 feet per day with an average of 2.69 days being spent on each hole. Total footage drilled between 1942 and 1949 was just under two million. Cost per foot was less than a dollar and a half. This included labor, materials and supplies, Schlumberger charges, water-contractor's fees and administrative overhead. The average cost per hole was under $2,000. Currently, the "400" and "500" rigs are making deeper holes. A record of 3,539 feet per hole was achieved on one recent project. More hole per rig work day is being made. Average through May was 1,330 feet at an increase in cost of about 10 cents per foot, but still not exceeding a dollar and a half. Considering that the cost of labor and materials is at an all-time high, these big rigs are operating still more economically than the smaller ones did.

Mene Grande is proud of the performance of all its drills, and of the men who have made it possible. The record of work accomplished will compare favorably with similar operations in any other country.

TWO MILLION TON STEEL LOSS CAUSED BY STRIKE SEVERE SETBACK TO OIL PROGRAM

By Joseph B. Huttlinger

THE STEEL STRIKE, which cost the petroleum industry two million tons of steel for use at home and abroad, promises problems for many months to come.

The strike, and the steel shortage which ensued, means an across-the-board delay in the industry's 18-month expansion program, outlined earlier this year by the Petroleum Administration for Defense. "There is little chance of meeting it," says Richard M. Morrison, the materials director of PAD.

The strike puts off decontrol over steel and other vital materials until well into next year, in the opinion of government officials.

It means that the industry, particularly inventory-short producers, will be scrambling for a limited supply of steel for months ahead.

The steel strike, like the oil strike, will share the blame in the event there is a tight supply of heating oil this winter. Top government planners are freely warning that only record-level operations of refiners can avoid a shortage. This is not to say that government sees the steel strike as a direct cause of oil shortages, for the effects are secondary.

The strike further may add steam to the PAD's drive for creation of industry committees on supply, working both worldwide and in the United States. A committee system was set up some time ago, but recently disbanded by PAD, although with reluctance. A search for the reason turns up the bitter opposition of the Justice Department, and its new Attorney General James P. McGranery, to anything that smacks of oil industry cooperation or, as he sees it, "conspiracy."

Adding up petroleum's loss from the steel strike, J. Ed Warren, deputy petroleum administrator, sees it this way:

Production: a total of nearly 90 days of tubular goods production was lost, enough steel to drill 9,000 new oil wells. Of the lost wells 8,000 would have been in the United States and 1,000 abroad. This indicates that the 1952 total of new United States wells may be only 42,000, the lowest rate in several years. Had these 9,000 lost wells been drilled, they would have increased oil producing capacity by 180,000 b/d in the United States and by 190,000 b/d elsewhere.

Transportation: A three-month delay is due for crude oil pipe lines designed to add a million barrels daily to capacity, and of products lines to add 400,000 b/d. A total of 6,000 miles of oil pipe line that would have been laid in the last quarter of 1952 is postponed.

Refining: A delay faces refining construction; the three-month loss of steel tonnage postpones construction planned to add 125,000 b/d to United States capacity, and 75,000 b/d abroad. The impact will be spread over a period of several months as refiners generally had steel inventories on hand.

Storage: About 12 million barrels of storage capacity scheduled for completion in time for use during the coming winter will not be ready this year for want of steel. This stands out as a serious threat to meeting oil demands this winter.

Natural gasoline: The strike means the loss of 900,000 barrels of natural gas liquids, gasoline and bottled gas at a time when these products are in heavy demand.

Natural Gas: A total of 300,000 tons of line pipe earmarked for natural gas lines to gas deficit areas was lost in the strike, about one-third of the industry's needs during the last nine months of this year. The result is that PAD will continue gas use limitations longer.

In facing this situation, the petroleum agency took some steps at once. It advised 5,000 American oil producers there would be no regular tubular goods distribution for the fourth quarter. Instead, PAD will use such tubular goods as become available to make sure second and third quarter tickets are honored. After that, the agency is taking care of wildcatters and emergency cases. An emergency case, it says, might be one where a man must drill to meet a lease deadline or to finish a well already started.

Further, the petroleum agency began pressing the Defense Production Administration, overall czar of the defense program, to see that the steel mills turn out their full share of steel for the petroleum industry after meeting imperative requirements of the military.

The steel strike is also a factor in the drive for higher crude oil prices. As the steel strike was settled, it meant raw steel would cost $5.20 a ton more. This, according to one source, means American producers will pay $20 million more each year for tubular goods. While top government stabilizers forced the oil industry to absorb higher wages to oil workers, there is some question how long they can compel the industry to absorb a marked rise in the cost of basic materials as well.

The cold war which is waged intermittently against the oil industry by certain groups within the Federal government is entering a period of renewed activity under the new head of the Department of Justice. The grand jury investigation of 21 oil companies engaged in international operations has been given a dramatic twist by the issuance of subpoenas requiring them to produce original documents from 1928 to date in the form of contracts, agreements, correspondence or memoranda relating to the acquisition, transfer, sale, exploration or working of crude oil deposits outside the United States; the purchase, sale or exchange of crude oil or products imported into or exported from the United States or manufactured outside the United States; and the acquisition or joint ownership of capital stock of companies producing or transporting oil, manufacturing products, holding or developing inventions, patents or processes used or for use outside the United States.

The mere collection and transmission of the entire business records of a score of companies doing business in all parts of the world and extending over 24½ years is a task of herculean proportions. The mere bulk of such an exhibit of records would be colossal, and even if the companies were able to deliver them by Sept. 3, many months would be required for their examination and classification by government officials. Prevalent opinion in Washington is that nothing can be expected to emerge from the deliberations for many months to come, but that continuance of the investigation may serve to keep the agitation alive during the current political campaign.

It is not expected that the inquiry will develop anything new since everything in connection with the operation of international companies has been described in full detail in repeated hearings going back to the extended testimony presented before the National Economic Commission in 1939, the Cole committee hearings, and others both before and since that time.

(Please turn to page 104)

OIL FROM MINAS FIELD REACHES WORLD MARKETS

THE OUTSTANDING FIELD development in Indonesia this year has been the inauguration of commercial production of the Minas field in Central Sumatra by Caltex Pacific Petroleum Maatschappij.

First cargo from this field was lifted in May, and by August the flow of crude from field to market had risen to about 17,000 b/d. This will rise to 20,000 b/d before the end of the year.

Completion of shipping facilities for the crude gives a substantial lift to the oil export position of Indonesia which has been slow in regaining its prewar position in world markets. Field and refining installations were badly damaged during the conflict and the post-war rebound has not been as great as in other areas, notably in nearby Borneo.

Indonesia has a substantial surplus of refined products available for export after taking care of domestic demands. Crude capacity of Indonesian refineries is about 153,000 b/d, somewhat more than the volume of crude being produced. This compares with a local demand in the republic of about 40,000 b/d this year.

Gasoline demand in Indonesia is less than 20 percent of the requirements for petroleum products. Kerosine, middle distillates, and residuals are consumed in far greater volume. In 1951 domestic demand approximated 31,000 b/d.

There is a good opportunity for Indonesia to develop substantial exports of crude oil to Oceania and Southeast Asia if sufficient supplies can be produced. Australia, New Zealand and the Philippines are large consumers of petroleum and do not now have indigenous supplies. These countries now are embarking on a very large refinery construction program. Japan is rebuilding its war-destroyed refining industry and must import raw materials. Competitors of Indonesian crude are primarily Borneo and New Guinea because of geographic location, and secondarily the more distant Middle East.

Installing steam boilers to heat crude oil before it is pumped into river tankers at Perawang. In background is cleared area to be used for offices and housing area of Caltex Pacific Oil Company in Sumatra.

Unloading pipe at Pakning Terminal of Caltex Pacific. All photos courtesy Caltex.

Indonesia is geologically favorable for the development of larger production. The Minas field, for example, probably has a known extent of 10,000 acres and thus far no dry holes have been drilled to mark the limits of the field. Only 45 wells have been drilled thus far, but enough is known to foster the belief that it is a major discovery. Development drilling is proceeding steadily with about four new wells per month being brought in.

The gently folded structure is producing from the lower Miocene at about 2,250 to 2,300 feet. The 35 gravity oil has a good gasoline yield, but is high in wax content which makes it difficult to handle. Unfortunately the crude is refractory from a refining standpoint so that catalytic cracking is necessary to obtain best yields. The higher gasoline yield from catalytic refining does not fit in too well with local needs, but will make the crude acceptable by Australian refineries when these are built.

At the present time, the oil is being shipped to West Coast U. S. refineries. Catalytic cracking facilities in plants there permit the use of a certain percentage of Minas crude in the feed streams, and the resultant higher yield of gasoline fits into the marketing pattern of the area.

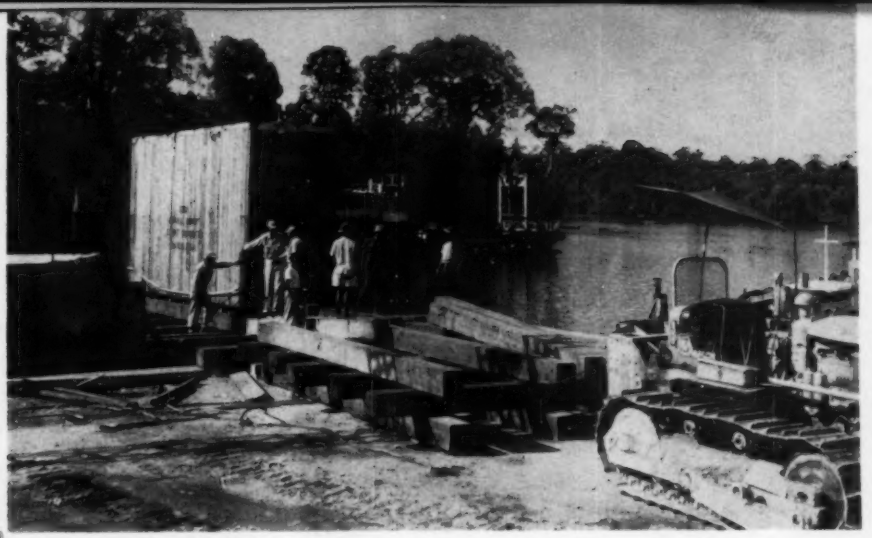
The long movement of oil from Indonesia to the United States is a reversal of the pre-war trend. Before World War II, California was shipping substantial quantities of oil to Oceania and East Asia. The development of the Middle East and the great upsurge of population and industrial development in Western U. S. has precluded substantial offshore shipment to the Orient. The West Coast now requires about 37,000 b/d more oil than it produces.

Standard Oil Co. of California began its search for oil in Indonesia as long ago as 1925. The Texas Co. joined in the venture in 1936. Preliminary geological and geophysical work had been completed and Minas selected as a good drilling prospect before the war. A road was built into the jungle, a camp established, and drilling of the first well was about to be undertaken when the Japanese invaders forced evacuation.

Caltex employees came back to Java in late 1945, but could not re-enter the Sumatra area of operations until late 1948. It was then learned that the Japanese had completed Minas I as a producer and some oil had been withdrawn during the war. Production was not large because of the lack of transportation

Above, two houseboats accommodate staff members working at Pakning, Sumatra. Below, Caltex Pacific workers board personnel boats for Pakanbaru.

Preparations are made for unloading a 50-ton diesel engine at Rumbai.



Dredge floated from Hong Kong to central Sumatra to deepen the Siak River channel at Perawang terminal.

facilities. It was much easier for the invaders to obtain the oil they required from Shell and Standard-Vacuum properties in south Sumatra, Java and elsewhere.

Once back in the area, Caltex found it necessary to rebuild the road, construct camps, import drilling equipment and supplies in order partially to evaluate the properties before building a pipe line, crude tank farms and terminal loading facilities. Drilling operations were again commenced in December 1949. The past two years have been busy ones in the Minas region. In addition to the big job of setting up a full-scale operation to produce Minas crude and deliver the oil to world markets, Caltex has been continuing its exploratory work on the large concession and has drilled a number of wildcats. None of these is being commercially produced as yet.

The Minas field is a hundred odd miles inland from tidewater. To bring out the crude it was determined to lay 17 miles of 12-inch line from the field to Perawang on the Siak River. Here a dock was built for loading oil into shallow-draft river tankers. These vessels carry the oil 90 miles downstream where a marine terminal has been built for assembling cargo quantities and ocean tanker loading facilities have been built.

Thus far the company has been operating one river tanker between the terminal at Pakning and the end of the pipe line at Perawang. A fleet of three such boats is planned at the present stage of operations, each with a capacity of about 24,000 barrels. The vessels are motor driven and have a speed of about 10.5 knots. Subject to further actual operating experience, it is expected that each of these vessels will deliver a daily quantity in the range of 11,000 to 13,000 barrels.

Some consideration was given to building a pipe line the entire distance to the Strait of Malacca, but this idea was abandoned, for the present at least, because of the waxy character of the crude and extremely difficult intervening terrain conditions. The oil usually requires heating

Left, laying corduroy road in Sumatra oil development area. Above, a series of drainage canals were built to protect newly constructed roads covering swamp area.

The C-47 "Caltex Star," besides transporting personnel, is used to carry small cargoes from Djakarta and Singapore which may include vital pieces of equipment.

before pumping through the present 17-mile line and requires temperature maintenance during river transit and while stored at Pakning.

Development of Minas and of the transportation system has provided employment for about 1,400 persons, of whom about 1,200 are Indonesians and about 200 foreigners. Although housing is being erected as rapidly as possible, it is as yet inadequate to meet requirements. Many staff technicians and administrative employees have been living in houseboats at the Pakning ocean terminal and at the Rumbai base camp and field supply depot on the Siak River from which camp access is had to the field.

When Caltex returned to the area after the war, it was found that the pre-war work had to be done over again. The jungle had reclaimed the road and camp clearings. A new right of way was hacked through the jungle and a road built to bring in pipe, drilling and pumping station equipment and the complex stores required to operate an oil field enterprise some 10,000 miles from primary supply bases.

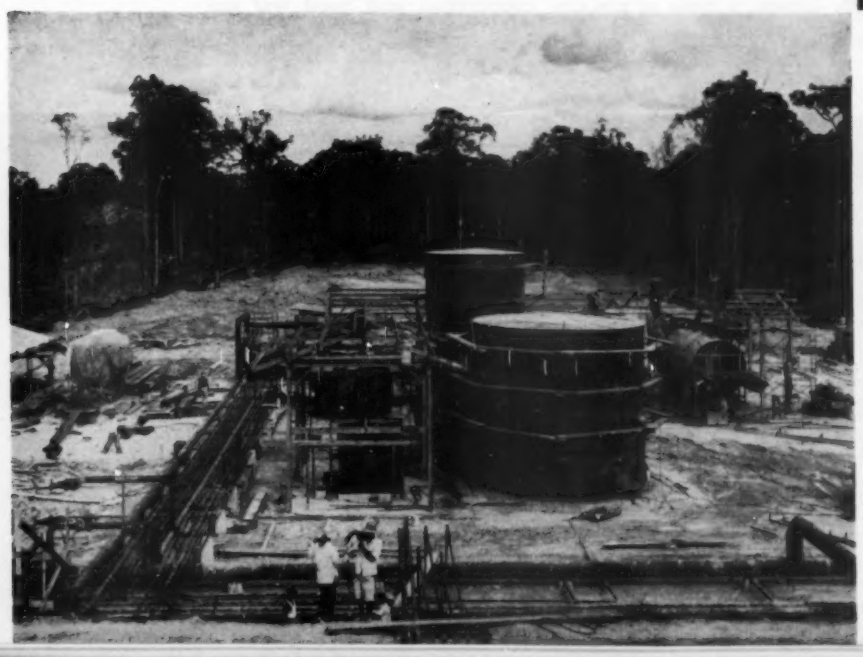
Caltex has set up a commissary open to Indonesian and foreign employees. First aid, clinical, and hospital facilities are being provided for members of families as well as employees. An effort is being made to raise the general level of health through medical care.

Job training has been undertaken by Caltex to insure maximum use of Indonesian skills in the operation. Experience has shown that local employees have been quick to learn both mechanical and technical skills. They have shown outstanding aptitudes for precise work in cartography and in general draughtmanship.

Many months and a very large investment have been necessary to develop the Minas field to the point where its product can reach distant world markets. The basic groundwork now has been done so that the enterprise can go forward if stable national and international conditions and a favorable climate for development prevail.

Corner of drafting room in office of Caltex Pacific at Rumbai.

Radio-telephone communications shack at Rumbai, Sumatra. From this central station it is possible to contact every part of the Caltex installations by radio-telephone, often saving days of travel.



View of construction of central pump station at Minas.

IRAQ PETROLEUM CO.

an outstanding example of successful cooperation by private enterprise

By E. LAWSON LOMAX

IRAQ Petroleum Company Ltd. is an outstanding example of an organization established by international agreement, made up of representatives of several nations, but directed and operated by private capital and conducting its business on a purely competitive basis. Its composition was influenced by events preceding and following World War I, and it is noteworthy that the right of American companies to share in its ownership was won only by the insistence of the Department of State of the United States under the direction of its distinguished Secretary, Charles E. Hughes, upon the principle of the "open door" to which the American government was then strongly committed. The success of the stand then taken marked the first important participation of American capital in development of the Near East in which it has since played a conspicuous part. Since its inauguration and the completion of its first pipe line in 1934, Iraq Petroleum Co. has enjoyed a remarkable growth. With the recent expansion of its production and the extension of its transportation facilities, it has taken a place among the leaders of the industry in the vastly important Near East area with an output expected to reach 450,000 barrels daily by 1954. The company has been a leader also in the maintenance of friendly and cooperative relations with the government of the country in which it operates, sharing its growth in prosperity with the people of Iraq, improving living and social conditions, and actively supporting the movement to develop the nation's agricultural and industrial resources. Under the leadership of the company's managing director, H. S. Gibson, a basis of genuine cooperation and good will has been established.

Drilling rig which brought in Zubair No. 1 at Basrah, Iraq.

King Faisal II of Iraq.

H. S. Gibson, managing director of Iraq Petroleum Co.

Lord Cadman, first chairman of Iraq Petroleum Co.

AN AGREEMENT between the government of Iraq and the group of companies represented by the Iraq Petroleum Co., comprising British, Dutch, French, and American interests, was signed on February 3, 1952 by His Excellency Abdul Majid Mahmoud, Minister of Economics, on behalf of the Iraq government, and H. S. Gibson, managing director of the Iraq, Mosul and Basrah Petroleum Companies. Under the agreement, approved by the Iraq Chamber of Deputies on February 14, 1952, and ratified by the Senate on February 17, 1952, the group of companies has guaranteed to produce certain minimum quantities of crude yearly.

The Iraq Petroleum Co. and the Mosul Petroleum Co. will together produce a minimum of 22 million tons of crude oil *per annum* from 1954 onwards, and the Basrah Petroleum Co., which has recently started production from the Zubair field near Basrah, has undertaken to produce annually a minimum of eight million tons from the end of 1955.

The concessions held by the Iraq Petroleum Co. and its associated companies are as follows:

Iraq Petroleum Co.: the provinces of Baghdad and Mosul east of the Tigris; 75 years from March 14, 1925.

Mosul Petroleum Co. Ltd.: all of Iraq west of the Tigris and north of latitude 33; 75 years from May 25, 1932.

Basrah Petroleum Co., Ltd.: all of Iraq not covered by the IPC and MPC concessions nor the transferred territories (now held by the Kuwait Oil Co.); 75 years from November 30, 1938.

Lebanon Petroleum Co., Ltd.: exploration license covering 500 square kilometers; effective from March 7, 1938.

Jordan Petroleum Co., Ltd.: the whole of the Kingdom of Trans-Jordan; 75 years from May 10, 1947.

Petroleum Concessions, Ltd.: exploration permit over the Aden Protectorate effective from January, 1938.

Petroleum Development (Trucial Coast), Ltd.: six concessions and one exploration permit from the rulers of the Trucial Coast, of which the boundaries are largely undefined; 75 years from various dates in and since 1937.

Petroleum Development (Qatar), Ltd.: the whole of the Qatar peninsula; 75 years from May 17, 1935.

The capital of the Iraq Petroleum Co. and its associated companies is held as follows:

The Royal Dutch/Shell Group	23.75%
Anglo-Iranian Oil Co. Ltd.	23.75%
Compagnie Francaise des Petroles	23.75%
Standard Oil Co. (N.J.)	11.875%
Socony-Vacuum Oil Co.	11.875%
C. S. Gulbenkian	5.00%

In the case of the associated companies, the producing areas at present are in the territories of the Iraq and Basrah Petroleum companies and that of Petroleum Development (Qatar), Ltd.

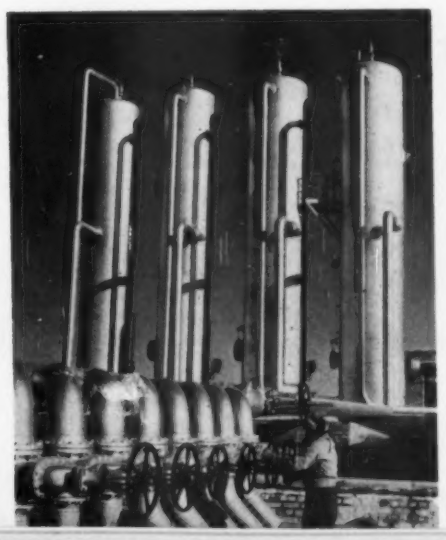
Until recently the production of the Iraq Petroleum Company was limited by its pipe line capacity, but with the completion of the 30-32 inch line to Banias, following completion of the northern leg of the 16-inch line to Tripoli, production has been stepped up considerably and there is no doubt that the agreed production from the Iraq and Mosul areas of 22 million tons per annum will be reached before 1954, the agreed date.

Production from the Basrah area started late in 1951 through a 12-inch line, but with the completion of the new 24-inch line, production should reach the agreed figure of eight million tons yearly by the stated time, i.e., the end of 1955.

The first concession for oil exploration in Iraq was granted by the Turkish government in the latter part of the 19th century to the German-controlled Baghdad Railway Co., but never became operative.

Early in the 20th century the D'Arcy Exploration Co. became interested in exploration for oil in Mesopotamia, and was promised a concession in 1904, which promise however was not confirmed.

The Shell group, through the Anglo-Saxon Petroleum Co., was active in the



Left, Baba Gurgur No. 1, discovery well in the Kirkuk field which was drilled in on October 14, 1927. Right, crude degassing station in the Kirkuk field.

area between the years of 1906 and 1910.

The overthrow of Abdul Hamid's government in 1910 led to the interruption of negotiations for concessions, and in 1911, African and Eastern Concessions, Ltd. was formed to negotiate concession agreements with the new Turkish government. In 1912, the Anglo-Saxon Petroleum Co. was allotted a 25 percent interest in this British-German company and the name was changed to Turkish Petroleum Co., a registered British company.

This company was reorganized early in 1914, the D'Arcy Exploration Co. subscribing new capital equal to the existing capital of the company, the shareholding then becoming D'Arcy Exploration Co. 50 percent, Anglo-Saxon Petroleum Co. 25 percent, and Deutsche Bank 25 percent.

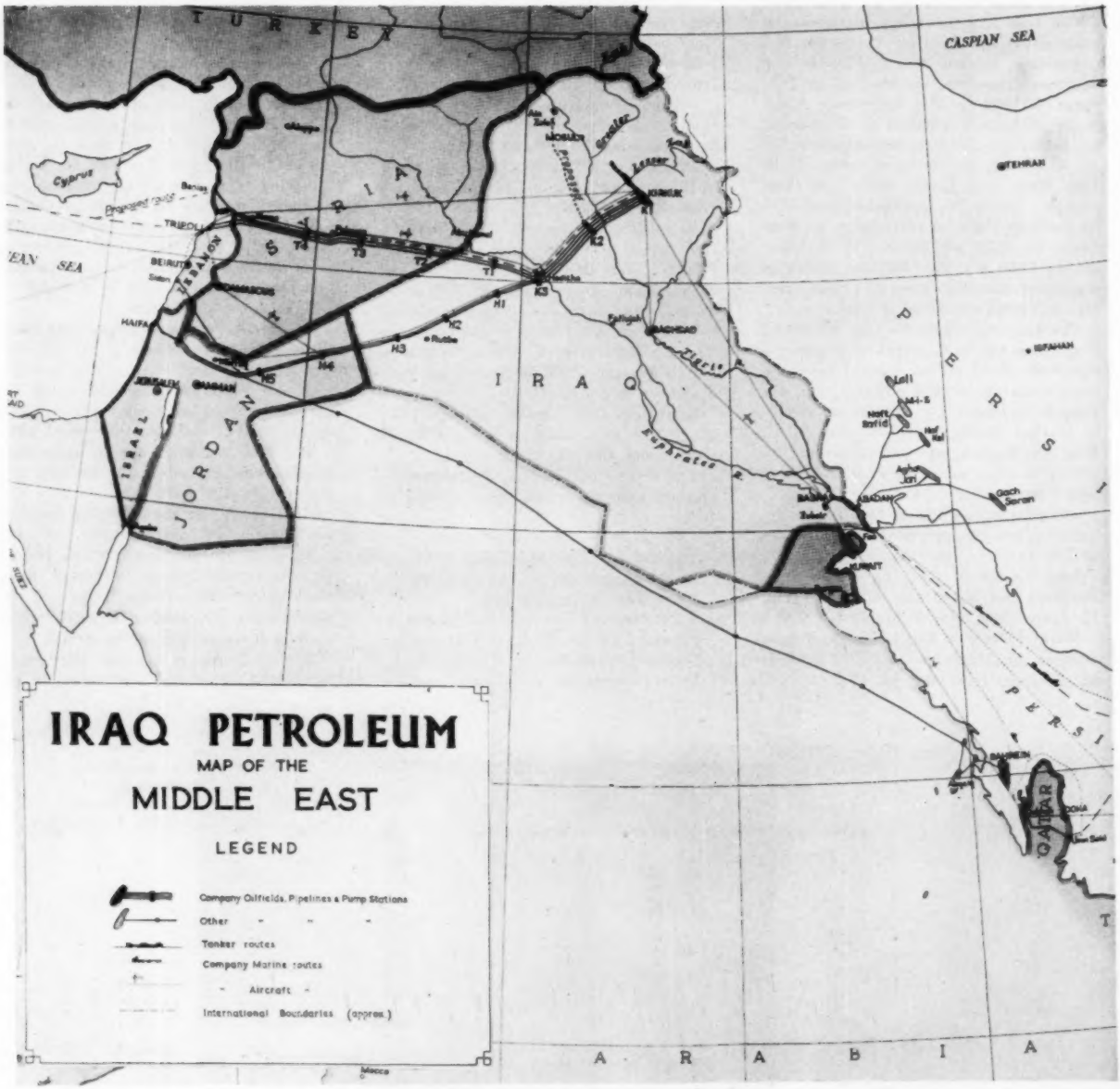
C. S. Gulbenkian played an active part in the negotiations, and on the reconstruction of the company, the D'Arcy Exploration Co. and the Anglo-Saxon Petroleum Co. each held 2½ percent of the total stock for him as a "beneficiary five percent interest without voting rights."

The agreement on this basis, which was signed at the British Foreign Office March 19, 1914, contains a clause stating that none of the signatories to this agreement would act independently "directly or indirectly in the production or manufacture of crude oil" within an area described as "the Ottoman Empire."

In June, 1914, the Grand Vizier of Turkey promised the Turkish Petroleum Co. a lease of "the petroleum deposits already discovered or to be discovered in the vilayets of Mosul and Baghdad."

When the first World War broke out in August, 1914, the Deutsche Bank's share in the company was taken over by the British custodian of enemy property, but the company was inactive owing to Mesopotamia being under enemy occupation during most of the war.

After the war, the German share in



the Turkish Petroleum Co. was assigned to France by the San Remo agreement of April 24, 1920, but this brought a protest from the State Department of the United States on May 12, 1920, against the exclusion of American oil interests from Mesopotamia.

This protest, after a long series of diplomatic negotiations, led to the reorganization of the Turkish Petroleum Co. in order to include a number of American companies who were grouped together in the Near East Development Corporation. Included in this group were: The Atlantic Refining Co., Gulf Oil Corp. of Pennsylvania, Pan American Petroleum & Transport Co., Standard Oil of New York (later Socony-Vacuum Co., Inc.), and Standard Oil Co. (N.J.).

In March, 1925, the Turkish Petroleum Co. obtained a concession covering the whole of the Iraq provinces of Baghdad and Mosul, and drilling was commenced in April 1927. Test wells were drilled at Palkhanah, Khasim Al Ahmar, Mjanah, Qaiyarah, Jambah and Baba Gurgur (Kirkuk). Oil was struck at Qaiyarah on October 13, 1927, and two days later at Baba Gurgur.

In order to allow for American participation in the reorganized company, the D'Arcy Exploration Co. surrendered half its original holding in return for a royalty of 10 percent on all the oil to be produced. This royalty was reduced to 7.5 percent in 1931.

The set up of the reorganized company was then:

D'Arcy Exploration Co.	23.75%
The Anglo-Saxon Co. (Royal Dutch/Shell)	23.75%
Cie. Francaise des Petroles	23.75%
Near East Development Corp.	23.75%
C. S. Gulbenkian	5.00%
	100.00%

A group agreement was signed in July, 1928, whereby the participants in the company agreed to act only through jointly-owned operating companies in all matters concerned with the exploration for and production of crude oil within an area defined on a map by means of a red line, which corresponded approximately to the former limits of the Ottoman Empire, and it was stipulated that the agreement should be construed according to, and be governed by, English law.

This is what was ultimately called "The Red Line Agreement." This agreement was terminated by mutual consent in 1948.

Under this agreement, all crude oil produced had to be offered at cost, plus one shilling per ton to each of the participants in proportion to their holding in the company.

In June, 1929, the name of the company was changed to Iraq Petroleum Co., Ltd., and in 1931 the interests of the Near East Development Corp. were acquired in equal parts by the Standard Oil Co. (N.J.) and Socony-Vacuum Oil Co., Inc., thus forming the present set-up.

In 1931, an amending agreement limited the Iraq Petroleum Co.'s concession to the area east of the Tigris. In 1932, a concession over the whole of Iraq lying west of the Tigris and north of latitude 33 was acquired by the British Oil Development Co. This company was bought out in 1935 by the group forming the Iraq Petroleum Co. which then organized the Mosul Petroleum Co. to operate the concession.

In 1938, the Basrah Petroleum Co., with the same set-up as the Iraq Petroleum Co., was granted a concession over the rest of Iraq not covered by the Iraq and Mosul Petroleum Co.'s concessions.

The Turkish Petroleum Co.'s concession of March, 1925, called for the construction of a pipe line to the Mediterranean as soon as the production rendered this commercially justifiable, and in any case an order had to be placed for a pipe line within four years after the testing of the plots selected for exploitation.

Oil in commercial quantities having been found in 1927, surveys for the pipe line were carried out between 1928-30, and in the autumn of 1930 it was decided to lay two 12-inch lines to the Mediterranean coast, following a common course from Kirkuk to the Euphrates and then bifurcating at Haditha, with a northern limb through Syria and Lebanon to Tripoli and a southern limb through Trans-Jordan and Palestine (Israel) to Haifa.

According to the "amending agreement" of 1931, the IPC had to produce plans for a pipe line system with a minimum capacity of three million tons *per annum* not later than August, 1941. One of these lines had to go via Haditha and Rutbah, terminating at the Bay of Acre, and to carry at least half the capacity of the system up to four million tons, the company being free to construct another trunk line to any other Mediterranean terminal. The work on the Bay of Acre line was to be completed by December 31, 1935.

Surveys were completed in the winter of 1931 and preparations were started in 1932 to carry out the work. Actual construction of the main pipe line commenced in August, 1932, with a labor force of 4,878 local and 182 foreign employees.

Construction of the north line to Tripoli was completed in July, 1934, the first oil reaching that port on July 14. The southern line was completed in October, 1934, the first oil being delivered to the Haifa terminal on October 14, exactly seven years after oil was first struck at Kirkuk in Baba Gurgur Well No. 1.

Twelve pump stations were built, three near populated areas and nine out in the desert. These house the power and pumping plant necessary to maintain the flow of oil at the designed throughput, act as control points for checking the quantities passing through the line, and also as bases for line repair and maintenance. Situated as they are in the desert, all requirements for staff maintenance have to be transported to them by the company.

Prior to the actual construction of the line, much preparatory work had to be carried out. In the first half of 1932, several wells were drilled for water essential for general use during operations, and railhead depots for the handling of freight of all kinds were constructed at Tripoli, Homs, Mafraq, Baiji and Haifa.

After completion of the pipe lines in the latter half of 1934, production from the Kirkuk field commenced, a total of 932,000 tons being produced in that year By 1937, it had risen to four million tons per year, this being the maximum capacity of the original pipe lines to Tripoli and Haifa.

At the time when the northern branch of the line to Tripoli was put into operation 14 producing wells on the Baba dome were completed in addition to 12 exploration wells, two of which were on the Avanah dome. By the outbreak of World War II in September, 1939, one more producing well had been completed on the Baba Gurgur dome and 27 more exploration wells. The results from this drilling were such that a large increase in production was justified and plans were commenced for increasing the pipe line delivery capacity by the construction of new 16-inch lines, to be laid parallel to the existing 12-inch lines, which would enable the capacity to be raised to 15 million tons per year.

These plans, however, were frustrated by the outbreak of war, when the Middle East was the scene of military operations and steel for pipe and machinery for the new lines was not available.

There was a short shutdown, when war began, owing to the suspension of deliveries, but on resumption of operations, production was raised to the normal amount until June, 1940, when, owing to the closing of the Mediterranean, it was severely curtailed and did not again rise to normal until 1944.

In 1945, pipe for the new lines was ordered and construction commenced in 1946. By the spring of 1948 construction of the southern leg of the 16-inch line to Haifa had reached to within 50 miles of the Mediterranean seaboard, but disturbed conditions in Palestine led to the suspension of operations on this section and the closing down of the Haifa refinery.

This refinery, owned by Consolidated Refineries, Ltd., a joint investure of the Anglo-Iranian Oil Co. and the Shell Group, was commissioned in November, 1939, with an original planned capacity of 2-2.5 million tons per year, working on Iraq pipe line crude, but the advent of war led to rapid expansion, and in spite of material shortages, the refinery attained a capacity of over four million tons before the end of the war. The necessary crude,

Interior of operating room at K.1 pump station on the Iraq pipe line. Each station is equipped with similar facilities.

above that delivered from the Haifa leg of the pipe line, was imported from the other terminal at Tripoli.

A big expansion program, designed for over seven million tons yearly of crude throughput, was commenced during the immediate post-war years, but was brought to a standstill by the Israeli-Arab troubles at the end of the mandatory period in the spring of 1948, which also led to the closing down of the Haifa refinery and the cessation of deliveries through the section of the pipe line supplying it.

Work on the new 16-inch line to Haifa was therefore suspended forthwith and all personnel, plant and material transferred to the northern line from Kirkuk to Tripoli. Delivery of crude through this line commenced in July, 1949, and reached full capacity in 1950, when the production from the Kirkuk field rose to an annual rate of 7.5 million tons in spite of the fact that deliveries through the existing 12-inch line were denied owing to the Arab-Israeli dispute.

When the 12-inch lines were laid, they were coated with asphalt enamel and then wrapped with asbestos paper, both operations being carried out by hand. From 1940 onward, leaks became frequent and were increasing, until by the end of 1947 more than 7,000 had been recorded. Prior to this time, in 1945, an extensive reconditioning program had been inaugurated to bring the existing line into first rate condition. Modern cathodic methods of preventing corrosion were established during the building of the 16-inch lines and also on the 30-32 inch new line.

This maintenance and prevention of corrosion technique had to be continued on the dormant line of the southern leg; otherwise extensive reconditioning would have been required whenever it was returned to service.*

The greatest expansion of the company came with the construction of the new 30-32 inch pipe line from Kirkuk to Banias on the Mediterranean coast which was put into initial service in April last. When in full operation, it will have a capacity of 14,000,000 tons yearly, or approximately 300,000 barrels per day.

With the growing output of the Zubair field of Basrah Petroleum Co. and that of Petroleum Development (Qatar) Ltd. on the Persian Gulf, Iraq Petroleum Co. and its affiliates will take rank with the companies operating in Saudi Arabia and Kuwait with a daily production of over 850,000 barrels.

* A full description of the methods has been published by W. C. R. Whalley, head of the corrosion engineering department of the Iraq Petroleum Co., in the *Journal of the Institute of Petroleum*, Vol. 35, pp. 705-734, October, 1949.

Owing to the geographical locations of the Iraq Petroleum Co. and its associates, every need of its foreign staff (British and American) has to be provided by the company, as well as a large proportion of the needs of its local employees.

In early days, before the Mogul invasion in the 13th century, irrigation from the rivers Euphrates and Tigris rendered Mesopotamia one of the more fertile districts of the Eastern Hemisphere, but destruction of this irrigation system caused the most fertile portion to revert to desert, in which condition, although still potentially very fertile, it still remains.

At Kirkuk the company has one of the best equipped modern hospitals in the Middle East. It has 120 beds and is staffed by European doctors, surgeons and a dentist, and by British and Iraqi nursing sisters. It also has a residential block for nurses. It provides medical, surgical, radiological, dental and ophthalmic treatment, which are available both to the company's employees and to the local inhabitants and tribesmen.

The clinics specialize in public health, antenatal and child welfare, and preventive medicine. An incessant war is waged against bubonic plague, yellow fever and malaria, and the tribesmen come in increasing numbers for inoculation.

There were no epidemic diseases in 1951, and the sickness and accident rates were the lowest in many years. During the year, 4,100 in-patients for a total of 39,900 hospital days were treated in the company hospitals. In addition, a total of 105,600 out-patients received attention at the company clinics and dispensaries and were given a total of 270,600 treatments. Over 16,000 routine medical examinations were carried out, and 26,000 vaccinations or inoculations.

In matters of public health and preventive medicines, cordial and co-operative relations are maintained with the local health authorities.

At the end of 1951 at Kirkuk 2,800 employees participated in the employees' savings group, representing 76 percent of the total eligible personnel, as compared with 68 percent at the end of 1950. The balance held by the group at the end of 1951 exceeded I.D. 60,000 (the Iraq Dinar = £1 sterling).

Domestic water and water for the power plant of the company is obtained from wells sunk in the alluvial banks of the River Zab, 20 miles to the northeast of Kirkuk. The pumping station has a capacity of five million gallons per day, and in addition to the above supplies, provides a certain amount for the town of Kirkuk.

The company's training center operates under the supervision of A. Hooper, and in it Iraqi youths are grounded in English, mathematics and elementary science while following courses in practical engineering, welding and carpentry. Twenty

pupils can be dealt with each six months, and those making this first grade are selected for further training which lasts 18 months. On successful completion of the total two-year course they are passed as Grade II. Qualified students out of the successful candidates are then sent to the United Kingdom for higher training to fit them for more responsible positions in the company.

During the past year an apprenticeship training scheme has been inaugurated, with twenty trainees participating in a mechanical engineering course. This scheme will give a course of training of from three to five years to young Iraqis to fit them for employment by the companies. The training will take place at Kirkuk, where a new technical center and training workshop are at present being built.

Fifty entrants will be admitted in 1952, limited to boys of 15 or 16 years of age who have reached as a minimum a complete primary schooling. They are to be recruited from the Kirkuk area, the stations of associated companies, or through the IPC office in Baghdad.

Kirkuk apprentices will live at home, and apprentices from other areas will be housed by the company unless they have relatives in Kirkuk with whom to live. All will receive payment of I.D. 10 per month during the first year of training, gradually rising to I.D. 20 per month during the fifth year.

Out of this, a small charge is made for books and sports gear, and in the case of those housed by the company, a charge will be made of I.D. 7 per month for rent and food. The cost of instruction and technical equipment will be borne by the company.

The courses will be designed to give the necessary training for entry into all categories of employment, it being intended that in the future the majority of skilled employees, whether in the engineering, petroleum or commercial fields, will be drawn from the apprenticeship scheme. It will also enable those who show special aptitude and make satisfactory progress to be chosen for higher grade education in the United Kingdom.

In accordance with the company's undertaking, in the 1951 agreement, to finance up to 50 students *per annum* selected by the government of Iraq for technical training in the United Kingdom, 75 students were undergoing training during the year.

In 1951, production from the Kirkuk field reached a total of 7,980,000 tons (164,000 barrels daily). During this year a large portion of the 30" line from Kirkuk to Banias was laid, about £21,750,000 ($60,950,000) being spent on it.

In the Kirkuk field £1,200,000 ($3,360,000) was spent on the expansion of production facilities to ensure the availability of crude oil for the 30-inch pipe line on its completion.

In this field there are now 44 producing wells, 33 of them at Baba Gurgur and 11 at Avana. These latter 11 wells are not yet being produced, but will go into production when required. In addition there are 17 observation wells, two of them being gas-oil, fourteen oil-water, and one water, while two more are to be drilled.

On the Mosul concession, £14,500,000 has been spent, and plans are now well advanced for the construction of a pipeline from the Ain Zalah field to the pipeline system at K-2.

(Please turn to page 102)

General view of the company's principal hospital at Kirkuk. Photograph was taken in 1950.

Materials Policy Commission Report

Under the title "Resources for Freedom" the President's Materials Policy Commission has issued the first installment of a five volume report surveying the resources and industries of the United States and the outlook for maintaining the supply of materials on which the continuing growth of the nation's productivity must depend. The study, which is the first comprehensive attempt to inventory the primary resources of the United States, surveys the rate at which they are being used and the policies needed to assure the security and economic welfare of the country.

The survey has been conducted under the direction of a commission appointed by the President in January 1951, composed of men prominent in industrial life, and without government participation. The chairman is William S. Paley, chairman of the Columbia Broadcasting System. Other members are George R. Brown, vice president of Brown & Root Co., Houston; Arthur H. Bunker, president of Climax Molybdenum Co.; Eric Hodgins, member of the editorial board of Fortune; and Dr. Edward S. Mason, dean of the graduate school of public administration of Harvard University. The commission has had the services of a staff composed of experts in

OUTLOOK FOR FUTURE OIL SUPPLIES

THE REMAINING RESERVES of gas and oil that are known to exist in the United States are no match for the demands of the next 25 years. We certainly will discover more in the years ahead, but real costs of discovery and extraction, in the absence of steady improvements in technology, seem likely to rise as we are forced to drill deeper, to drill more "dry holes" for every well brought in, and possibly to rely on new pools of smaller average size. Even if oil discoveries and production keep rising for a decade or more—which they may or may not do—United States demand may far outstrip domestic production, as it has started to do lately. Demand for natural gas may outpace supply and put further upward pressures on price. We will not suddenly "run out" of these highly important fuels, but we could well enter a long period of rising real costs.

Between 1925 and 1950 domestic oil production rose from about three-quarters of a billion barrels to nearly two billion, and rose another quarter billion in 1951. Proved recoverable reserves in 1951 were estimated at 27.5 billion barrels (excluding 4.7 billion barrels of natural gas liquids) against only 8.5 billion in 1925.

But not matter how large the nation's petroleum resources ultimately prove to be, one fact is now clear: eventually the resources will dwindle and become progressively inadequate. One warning signal already has appeared; within the past five years, United States demand for crude petroleum has begun to outstrip domestic production and, for the first time, the United States has become an important net importer.

The recent development suggests that the United States, faced with an approximate doubling of oil demand by 1975, will find it economical to turn increasingly to foreign supplies and eventually to liquid fuel from shale and coal.

What happens in oil will affect developments in gas, synthetic oil, imports, and coal and could importantly influence security in wartime. In spite of uncertainties over future sources of supply, these facts and prospects seem clear.

First, discoveries of petroleum in this country will not stop abruptly, nor will reserves become exhausted suddenly and without notice.

Second, domestic crude production can be counted on for a long time to supply a sizable portion of liquid fuel demand, even though it is debatable whether the 1975 level of production will be lower or higher than now.

Third, regardless of the level of domestic production in 1975, imports of crude oil and refined products probably will be greater than now.

Fourth, synthetic oil, probably first from shale and later from coal, will come into commercial production within a decade or so, perhaps sooner.

What appears fairly certain, then, is that the nation's liquid fuel supplies in 1975 will come from three main sources: domestic crude, imports and synthetic oil. The question that cannot now be answered is: What part of the total liquid fuels will each of these three sources supply to the nation in 1975? The answer will be governed largely by the behavior of relative costs of domestic crude, imports and synthetics, provided competitive market forces are allowed reasonably free rein.

Liquid fuels already present a serious security problem to the whole free world and this problem is likely to increase.

If war should come, whether next year or 25 years hence, the liquid fuel needs of both the United States and its allies would rise abruptly. The loss of any source of supply—particularly in the Middle East—would throw almost the full burden upon Western Hemisphere resources. Western Europe's dependence on Middle Eastern oil is expected to increase in the years ahead; the United States may rely to a greater extent on imports from vulnerable areas. The security problem obviously will increase with the passage of years.

Limitations on domestic petroleum resources will exert upward pressures on real costs from now on. Experts generally agree that the real costs of crude oil discovery and development may rise considerably. The Independent Petroleum Association of America recently stated: "There is an immutable, long-term trend toward higher crude oil replacement costs. . . . This trend may be temporarily arrested or even reversed, but can never be permanently arrested or reversed."

Domestic prices of crude undoubtedly could be expected to rise considerably as a result of these pressures except for the existence of competitive sources of liquid fuels. Actually, competing imports and expansion of synthetics can be expected to set a ceiling for the prices of all liquid fuels. . . . Even with high shipping costs, royalties and profits included, foreign oil

the various subjects it was called upon to study and has had the cooperation of scientific bodies, educational institutions and specialists in many fields of endeavor.

In its statement of convictions, the members of the commission emphasized the following three points:

"First, we share the belief of the American people in the principle of growth . . . It appears preferable to any opposite, which to us implies stagnation and decay.

"Second, we believe in private enterprise as the most efficacious way of performing industrial tasks in the United States. With this belief, a belief in the spur of the profit motive and what is called the price system obviously goes hand in hand. This method, motive and system have served uniquely well in America. . . . We believe in a minimum of interference with these patterns of private enterprise, but to believe in a minimum of interference is not to believe that this minimum must be set at zero. . . . As we see the future, the coexistence of great private and public strength is not only desirable, but essential to our preservation.

"Third, we believe that the destinies of the United States and the rest of the free non-communist world are inextricably bound together. . . . If we fail to work for a rise in the standard of living of the rest of the free world, we thereby hamper and impede the further rise of our own and equally lessen the chances of democracy to prosper and peace to reign the world over."

The scope of the commission's study covered the broad range of essential materials including agricultural resources, supplies of energy and mineral industries, as well as economic trends and trade conditions. To give practical point to its deductions, it plotted the effect of prevailing factors extended over the period from 1950 to 1975. Its conclusions were that the United States is the world's biggest consumer of materials, that it is using up reserves faster than other countries and that the overall objective of a materials policy for the nation should be to insure an adequate and dependable flow of materials at the lowest cost consistent with national security and with the welfare of friendly nations.

Separate studies of existing resources and of the future outlook for basic industries are included in the report. A prominent place is devoted to oil as a resource of primary and growing importance in the supply of energy. The chapter dealing with this subject, with some abridgement, is reproduced herewith.

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will be increasingly competitive in the United States.

"Synthetic" gasoline from shale already is estimated to cost no more than 25 to 30 percent more than gasoline from crude in some domestic markets, with opportunities for cutting costs further as technology advances. Whether or not synthetics from coal are close to becoming competitive still is a matter of controversy, but there is promise that they will become increasingly so as their technology improves. There is particular promise in possible joint production of chemicals, liquid fuels, and electric energy from coal and lignite at lower costs than would be possible if each were produced separately.

These highly expansible competitive sources of liquid fuel can be expected to keep the price of domestic crude from rising more than 25 to 30 percent (relative to the nation's general price level) over the next 25 years, and the rise may be far less. Thus, only that crude petroleum which can be discovered and produced in the United States within these economic limits will enter the energy stream. How large a quantity this will be cannot now be forecast with any accuracy, but as oil gets harder to find, further cost-reducing advances in the technology of discovery and recovery will be required for domestic crude oil to hold a strong position. The industry certainly will take full advantage of future opportunities.

Domestic crude production is still far from the end of the road, but even under fairly optimistic assumptions, it probably cannot keep pace with rising domestic needs up to 1975.

The United States is currently consuming about two-thirds of the free world's total annual petroleum production, although its domestic "proved crude oil reserves" are only about one-third of the free world's total, and its potential is probably a far smaller fraction. Though the spread between the real costs of foreign and United States petroleum production will probably grow, imports will not flood the United States market and drive out domestic production. A steady rise in free world demands for oil, accompanied by rising marginal production costs in the United States, will tend to push up the world price, thus supporting the market for domestic output. In short, the price of imported oil in the United States is likely to bear a much closer relationship to the production costs of marginal domestic crude output and synthetic oil than to the actual production costs of foreign oil.

Oil production undoubtedly will expand much more rapidly abroad than in the United States over the next quarter century, though there are factors which put definite limits on the rate of such expansion. In the near future, lack of steel for tankers, pipelines and drilling, and of competent managers and labor trained in all of the specialized skills required in oil fields and refining will prove a handicap. For both the short and long run possible political difficulties may seriously discourage private investment in foreign petroleum and retard the growth of production.

The Commission believes that present knowledge of this nation's future oil position does not warrant discrimination against imports of crude oil from any quarter of the world. Every encouragement should be given, within limits of economic reasonableness, to establishing greater oil reserves and production capacity in relatively safe areas, particularly in the Western Hemisphere, but not by placing penalties on oil production elsewhere. In view of its future needs and limited resources, this nation should welcome crude oil imports, not place obstacles in their way. Tariffs on crude oil imports should therefore be held down, reduced, or eliminated, within the limits imposed by national security considerations.

The tasks of policy in meeting expanding peacetime demands for liquid fuels do not appear formidable. It seems clear that imports and domestic synthetic oil over the years could take up any slack in United States liquid fuel supplies and impose a competitive ceiling on oil costs not very much above present levels.

Private business can be counted on to bring about the bulk of necessary adjustments at an appropriate pace if no uneconomic impediments to domestic crude oil exploration and production are allowed to develop, if imports are permitted to flow freely in whatever amount the price situation dictates and if synthetic production is not discouraged by shortages of capital, monopolistic restraints, or the like.

There is need for private action on the demand side, too, so that more use can be made of available supplies. The Commission's studies indicate that there are many points at which this nation could reduce the consumption and physical waste of liquid fuels with little or no reduction in the service rendered to ultimate consumers.

The oil and automobile industries in particular carry a heavy obligation, in the Commission's judgment, to lead the nation toward a more efficient use of its liquid fuel supplies, and consumers themselves can contribute strongly if kept properly informed of conservation measures they can take.

The security problem in oil can be viewed realistically only in terms of total free world demand and total free world supply. The outbreak of all-out war would create a sudden, and probably wide, gap between requirements and current supply for the United States and other free na-

tions alike, particularly for naval and specialized aviation fuels. Enemy action could well curtail production or cut off rich sources.

Severe rationing of nonmilitary use would fall far short of closing the gap even with much stricter reductions than in the last war. There can be no conventional stockpile of oil to fall back on. Therefore, the equivalent of a stockpile —an emergency cushion of oil production, refining, and transportation capacity in the Western Hemisphere which can quickly increase supply—is imperative in meeting the problem.

How can such a cushion be provided?

The first prerequisite is, of course, to maintain a thriving oil industry in the Western Hemisphere. Given this, part of the answer lies in the ability of the industry to expand supply quickly by raising crude oil production above the normal peace-time production rate. If there is sufficient extra refinery and transportation capacity to handle this extra crude, an increase in refined products can be achieved quickly. But there are severe limitations on this particular cushion, both as to size and duration. Many oil wells that now are operated below maximum because of state regulation could not be brought up to their "maximum efficient rate" (MER). Wells can even be operated above MER for a limited period though at the expense of reducing the ultimate total volume of recovery. It is estimated that increased production achieved in this way by pushing known United States reserves would be only about 10 to 15 percent.

A further answer might be found in drilling more wells into known pools, but this approach has similar limitations. It was by no means enough during the last war, and as time goes on, it may prove less and less adequate. The domestic oil industry now manages to maintain production only by constant exploration and drilling to find new pools. This is as true in peacetime as it is under war conditions. During the last war large amounts of steel and manpower had to be devoted to oil exploration and much of this effort went into the drilling of dry holes. With each passing year, ever-increasing numbers of wells must be drilled to find new pools to keep production abreast of rising demand.

What obviously would help most in time of war would be to have an "underground stockpile" of semi-proved oil deposits which could be drilled up as required with maximum speed and at minimum expenditure of materials and manpower on "dry holes." A large area which lends itself to such treatment is presently the property of the United States government —the Continental Shelf, particularly that section off the Gulf Coast. Geologists are agreed that prospects of finding large pools of oil in this off-shore area are excellent. But there still remain the difficult and expensive technical problems of exploring and producing "underwater oil."

The private oil industry can solve these technical problems if given access to the Continental Shelf. Government leases permitting private oil exploration and development can provide such access and incentive. The nation can help to establish a security reserve of crude oil if leases are so written as to require wide spacing of wells or limited withdrawals, or both, and by setting royalty provisions which allow for adequate financial incentive. By allowing fewer producing wells than would be worked in normal practice, or keeping withdrawals below the usual rate, or a combination of both measures, the life of off-shore pools might be considerably prolonged.

Whatever resolution Congress may make on the long controversy over title to the oil resources of the Continental Shelf, provision should be made for the application of these security measures. Similar precautions should be taken to the fullest feasible extent on other oil reserves on both public and private lands. For a nation that is rapidly draining its known reserves of petroleum and is very uncertain as to how much remains to be found, and that faces the prospect of growing dependence on imports from other parts of a world torn with tension, the wise course would be to maintain a quickly expansible output from an established reserve of oil in its own ground.

The Commission therefore recommends: that the federal government encourage immediate exploration for oil on publicly owned off-shore lands; that leases to private companies, whether by the Federal government or the states, contain provisions requiring well spacing or withdrawal rates calculated to increase the normal life of the pools with a view of providing faster withdrawals if ever such action is required to meet the needs of war.

That, in administering federal oil lands generally, the Department of the Interior, wherever feasible, require conservative well spacing and withdrawal rates designed to prolong the life of pools and thus ensure a larger, readily available crude oil reserve whose production can be quickly expanded for emergency use.

That conservation agencies of oil-producing states likewise give heavy weight to this security objective in their regulation of well spacing and production rates.

It will also be desirable for the United States to encourage by any reasonable means the enlargement of crude reserves elsewhere in the Western Hemisphere.

In addition to a crude oil reserve capable of supporting a higher level of production in an emergency, there must also be corresponding standby refining and transportation capacity. The industry itself, once the steel production shortage eases, has incentive to enlarge capacity enough to carry a moderate "reserve capacity." If, in the light of later facts, this cushion of refinery and transportation capacity appears to be inadequate (which is likely to be the case at least for aviation gasoline refining capacity), then government and industry should work out means of building more.

Carrying out these recommendations will provide a "stockpile" of extra production capacity for an essential of war which cannot be stockpiled in the conventional way. It will cost money—a great deal perhaps—but the price of this insurance would be cheap if war should come.

The development of large-scale synthetic oil production using domestic coal or shale may some day lessen the security precautions that must be taken for petroleum, but that day is some years off at best. The technology of synthetic oil production has reached only the pilot-plant stage in the United States. To build immediately a huge synthetic oil development based on today's technology, involving an investment of dollars, materials, and manpower that might approximate that required for the atomic energy program in the last war, would be uneconomic and, by diverting strength from other production, might hurt national security more than help it. To keep such vast facilities in "mothballs" like an aircraft carrier awaiting the call to action would be very expensive, but as an active industry it most likely would be incapable of meeting competition without the aid of subsidies. In all probability lower cost methods of production would be found soon after operation began.

It would seem wiser to learn these same engineering lessons more quickly and cheaply. Some private companies are evidently prepared to construct small-scale commercial plants for this purpose if they can overcome financial problems. Principal among these is the higher cost of transporting their product from shale deposits to market areas, especially if it is necessary to ship by rail because the scale of operations would not warrant constructing a pipeline.

The Commission therefore recommends: that the federal government give limited financial assistance to any qualified private companies that will undertake the production of oil from shale in order to encourage as soon as possible the construction of small-scale commercial plants and thus accelerate the gaining of technical knowledge necessary for later economical expansion. For the present, one promising form of such assistance is for the Government to absorb a sufficient portion of the transportation costs from plant to market to give synthetics producers a competitive position with crude petroleum products in those markets.

That the National Security Resources Board, with the aid of the Department of the Interior, undertake a continuing study of the economic aspects of producing synthetic liquid fuels from shale and coal in relation to security needs and the outlook for future petroleum supplies.

Oil mining shaft in the Petroles section of the Zorritos field.

PERU'S EMPRESA PETROLERA FISCAL

By DR. J. E. RASSMUSS

THE CONCESSIONS of Empresa Petrolera Fiscal, the Peruvian government's oil company in Peru, comprise the entire coastal area of northern Peru north and east of the concessions of International Petroleum Co. and Lobitos Oilfields Ltd., extending to the Ecuadorian frontier and include 870,000 hectares (2,075,800 acres). To the south it follows the Sechura district in an extension of more than two million hectares (5,940,000 acres) which will be opened for private concessions according to the new law. Only a small area of about 200 hectares in the old field of Zorritos has been in exploitation and it is almost depleted. The principal producing field of Organos, which comprises 1,170 hectares (2,890 acres), is located farther south between the Lobitos concessions.

Empresa Petrolera Fiscal has improved its position during the past year. On the technical side it has introduced rotary equipment employing the services of the Santa Fe Drilling Co. of California, and the drilling time of wells has been reduced from about 4-5 months by the old cable tool rigs to 10-14 days by the new IDECO rig. From the commercial point of view, it has gained by abandoning the local market with its low ceiling prices and exporting most of the crude. Thereby a favorable balance was obtained and dollars earned.

The principal income of EPF proceeds from the 10 percent government royalty of Lobitos Oilfields Ltd., which produced 435,752 barrels last year. Adding its own production of 209,625 barrels in 1951 and a stock of about 35,000 barrels from 1950, plus a royalty advance of some 7,000 barrels from Lobitos, the Empresa had available 688,317 barrels in 1951. Of this quantity, 574,810 barrels of crude were exported, namely 454,813 to Argentina's YPF and 119,996 barrels to Ancap of Uruguay. Because of the loss on shipments to Argentina due to exchange, Empresa is shifting more and more to exports of crude to Uruguay. Only 102,463 barrels were delivered to the state refinery at Villar, corresponding to the compulsory quota for local consumption, which amounts to about 50 percent of Peru's oil production at present. The refinery run represented therefore only about 25 percent of the capacity of about 1,200 b/d, the refinery having worked only 84 days.

From the company's total income of about 34 million sucres ($2,193,000) in 1951 (against only eight million in 1949, when the entire output went to the domestic market), 27.2 million sucres came from exports and 4.2 million from local sales of refined products. The net earnings amounted to about nine million sucres ($600,000). More or less the same sum was spent for government taxes. Fixed assets amounted to 76.7 million sucres of which 63.2 million were contributions of the government. According to the new law, the capital will be increased to 500 million sucres, or roundly $33 million.

One of the most important features in the development in the past year was the enlargement of the Organos concession, which yields almost the entire production of EPF, by a new agreement with Lobitos Oilfields Ltd. As compensation for a claim of the government regarding the grade and volume of the delivered royalty, Lobitos Oilfields ceded in December 1951 a number of its concessions, which were intercalated and surrounded the EPF concessions in Organos, to the state enterprise. By this agreement the extension of Organos field was increased from 480 to 1,170 hectares, now called Patria concession, and its reserves were augmented by an estimated 4,143,000 barrels. Also four producing wells were included with a joint yield of 150 b/d.

Up to July 1952, 57 wells have been completed in Organos field, of which 13 were dry; 13,493 meters were drilled in 1951.

In the old field of Zorritos, production has declined to about 50 b/d from 30 wells. In the Cope section air injection has been employed to increase the pressure in the old wells and production has been raised from about 10 b/d to about 20 20 b/d. In the Peroles section a shaft 2.5 meters wide has been sunk to 70 meters depth to recover the remnant oil, estimated at 500,000 barrels, by mining. Three 7,000-foot exploration wells in Zorritos field, executed by Dunlap & Graham Inc., were dry holes.

In the Organos field, the Santa Fe Drilling Co. has brought in 17 wells, of which only one was dry. Average depth amounted to 1,900-2,300 feet. The recent well No. 69 gave an initial flow of 420 b/d, being stabilized by a 3/8-inch choke at about 240 b/d. The latest well, No. 70, completed on July 1, yielded 154 b/d. Cable tool drilling, which has been used until recently by EPF, will be abandoned completely.

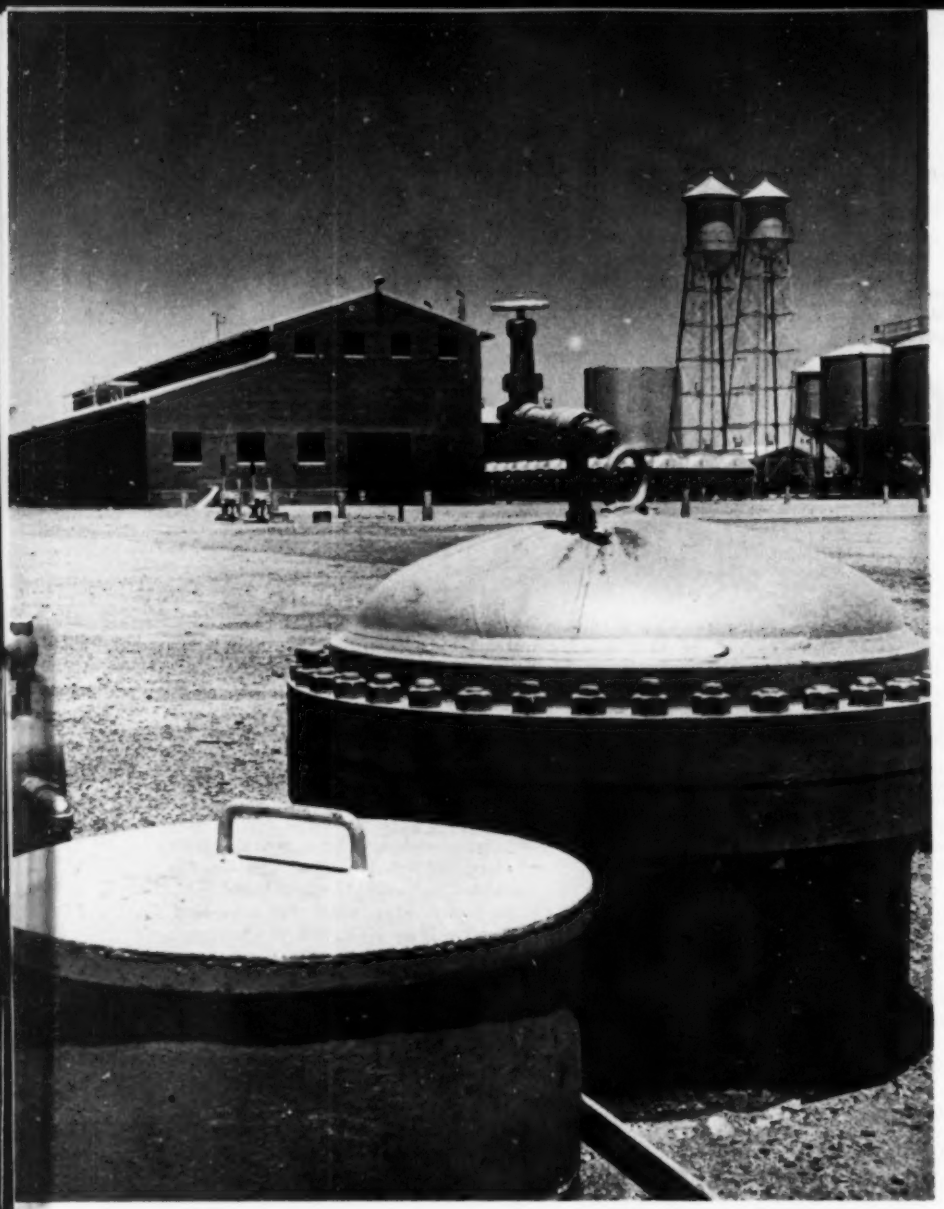
An exploration well is now being drilled in the Organos field by Dunlap & Graham to test the lower formations.

Production of EPF, which formerly amounted to only about 300 b/d, doubled last year by the new rotary drilling campaign and has increased since to about 1,000 b/d. Production increased from 23,415 barrels in January 1952 to 31,363 barrels in June.

Under the efficient and progressive management of Eng. F. Noriega Calmet, EPF has strengthened its position considerably, but does not aim to restrict the activities of private companies.

International Petroleum Company's production in the first four months of this year amounted to 3,778,426 barrels. Lobitos Oilfields Ltd. produced in the same period 1,449,477 barrels, EPF 96,393 barrels, and Ganso Azul 74,496 barrels, making the total output in this period 5,398,793 barrels against 5,121,231 in the same period of 1951, an increase of about 278,000 barrels or five percent.

New activity is expected, especially in the Sechura district, which will be opened for new applications on October 27, according to the regulations of the new law. Richmond Petroleum Co., Union Oil Co. of California, and Conorada Corporation are reportedly planning to enter the Peruvian picture. In addition, Cerro de Pasco Corp., the country's largest copper producer, recently modified its regulations to include petroleum activities.



Badanah pump station. Except as noted all photos are published through the courtesy of Arabian American Oil Co.

TAPLINE OPERATIONS:

Trans-Arabian line delivers 170 million barrels of crude across desert with less than 24 hours shutdown time for repairs.

THE 170,000,000th barrel of crude oil pumped through the trans-Arabian pipe line system from Saudi Arabia arrived at the Sidon terminal in Lebanon in early July of 1952. This record of transportation, which by sea routes would have required 65 tankers working full time, coincided with the completion of 19 months of Tapline operations. It also occurred during a time when tankers were in critically short supply and the demand for Saudi Arabian oil in Western Europe was at an all time high.

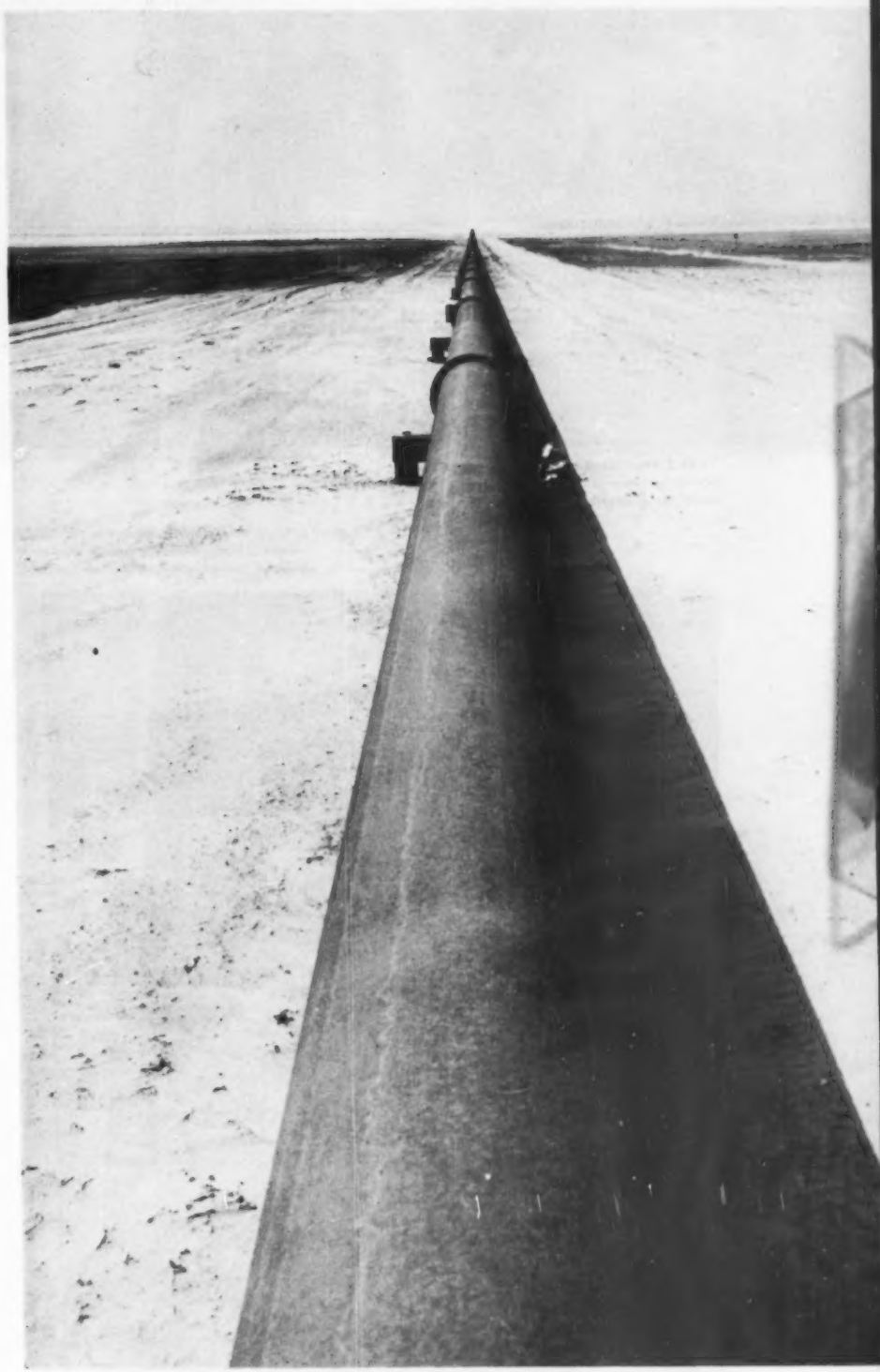
Since the first tankers loaded Saudi Arabian crude oil at Tapline's terminal five miles south of the ancient city of Sidon on December 2, 1950, there has been an average of almost three ships arriving daily. This commerce has restored marine activity to a coastal area once rich in the tradition of the sea as a major port and the principal city of historic Phoenicia.

Thirty-five miles north of the terminal, Tapline maintains its executive and administrative field offices at Lebanon's capitol, Beirut. This modern city is a center of trade, enabling Tapline to purchase certain items of food, operating supplies, and equipment required for the isolated pump stations. All materials which must be imported for Tapline from the United States and Europe pass through the port of Beirut.

Experiences encountered in the first year and a half of operation of the world's largest crude oil pipe line are significant and of technical interest, particularly because of unique design and construction features.

Crude oil is received from Aramco's tank farm at Qaisumah, Saudi Arabia, and pumped a distance of 753 miles to

Although 60 percent of Tapline is buried, there are sections such as this where salt marsh terrain required above-ground construction.



the marine terminal at Sidon, Lebanon. Four pumping stations are required which are all located in Arabia and have nearly identical pumping equipment. Each station except one contains five 1,710 hp Worthington diesel engines, directly connected through Falk speed increasers to Byron Jackson single stage centrifugal pumps. The fourth station at Turaif requires only four pumping units. Also, each station is equipped with three 800 KW generators directly connected to 1,320 hp Worthington engines.

In the initial stages of planning, concern was felt about the performance of the diesel engines when burning Arabian crude oil fuel. This crude is about 36 API gravity, but contains over 1.5 percent sulfur. Engine tests on Arabian crude fuel were run at Worthington's plant and a complete test pumping unit was installed in Arabia to determine engine performance under field conditions. As a result of these experiments, it was found necessary to use additive lubricating oils in the crankcase and cylinders of quality equal to MIL-O-2104 specifications in order to keep the pistons and cylinders clean and free of combustion products. During the test, it was learned that the use of straight mineral oil resulted in considerable carbon accumulation on cylinders and in broken piston rings after 500 hours' service. As a contrast, with proper additive lubricants and proper cylinder feed rates, not one piston ring was broken in the first year of pipe line operation.

The central control boards, which allow one man to control the entire station pumping operation from a single location, have been most successful. At present, the boards, engine rooms and utility rooms are being operated by local and European personnel, and American supervision is necessary only at the shift foreman level.

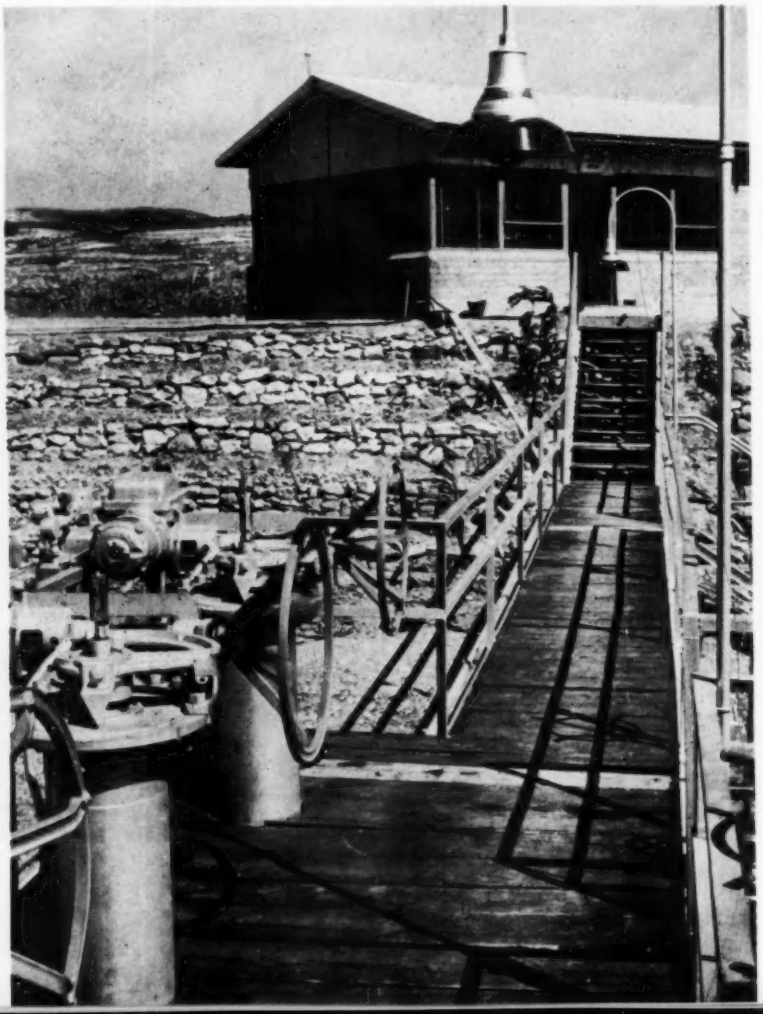
Securing an adequate supply of suitable water at the pump stations has been one of the most critical problems. Initial estimates indicated that 40,000 gallons per day should meet the industrial demand and requirements of station personnel. However, actual demands have exceeded 200,000 gallons per day, principally due to the needs of Bedouin tribes and their herds of camel, sheep and goats. During the hot summer months, it was estimated that 5,000 Bedouin families and 16,000 camels and goats were securing their water supply from a single station. To meet this demand, it has been necessary to provide between three and five actively producing water wells at each station, some of which are more than 1,200 feet deep.

Facilities are being constructed at each station to provide housing, offices, schools,

Tank farm valves at the Sidon terminal are remotely controlled from a central board in the tank farm control house.

Fully restrained construction was employed above ground, particularly firm anchoring being used at points where a change in direction of greater than one degree was necessary.

Control station at Sidon in background. Note unattended valves in foreground, one of which is spinning by remote control.

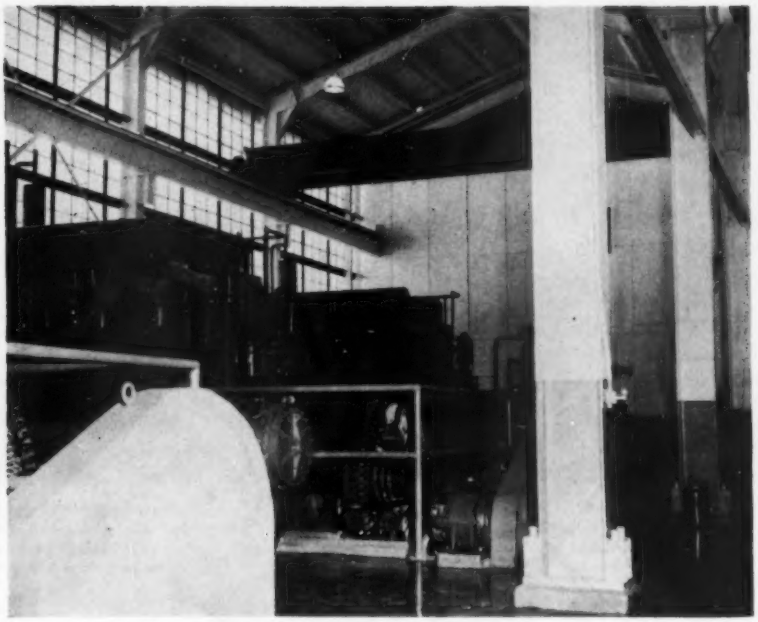


and other public buildings required for Saudi Arab government administration in the area. These facilities are being erected almost entirely by local contractors and local labor trained by Aramco and Tapline. When one considers that 15 years ago there were no skilled workers or contractors available in this part of Saudi Arabia, the rapid development of these artisan skills is all the more remarkable. It demonstrates the mutual advantages resulting from teamwork between Saudi Arabs and Americans.

The main line consists of 784.7 miles of 30-31 inch pipe and 4.7 miles of 22 inch pipe. The wall thickness of the 30-inch pipe varies from 7/16 to 1/4 inch and all of the 31-inch pipe is 1/4 inch thick. The pipe is distributed to conform to the hydraulic gradient, thereby minimizing steel requirements. The 22-inch pipe is used at the approach to the Sidon Terminal where elevation drops rapidly from the Lebanese mountains to sea level. Of the line, 376.3 miles are of fully restrained, above-ground construction and the balance is buried in the conventional manner.

The line was originally designed for a throughput of 315,000 b/d at 100 percent operating factor when transporting Abqaiq crude. Experience to date indicates that the actual annual average throughput under the same conditions is about 319,000 b/d. However, because a large portion of the line is above ground, variations in weather conditions cause relatively large throughput variations.

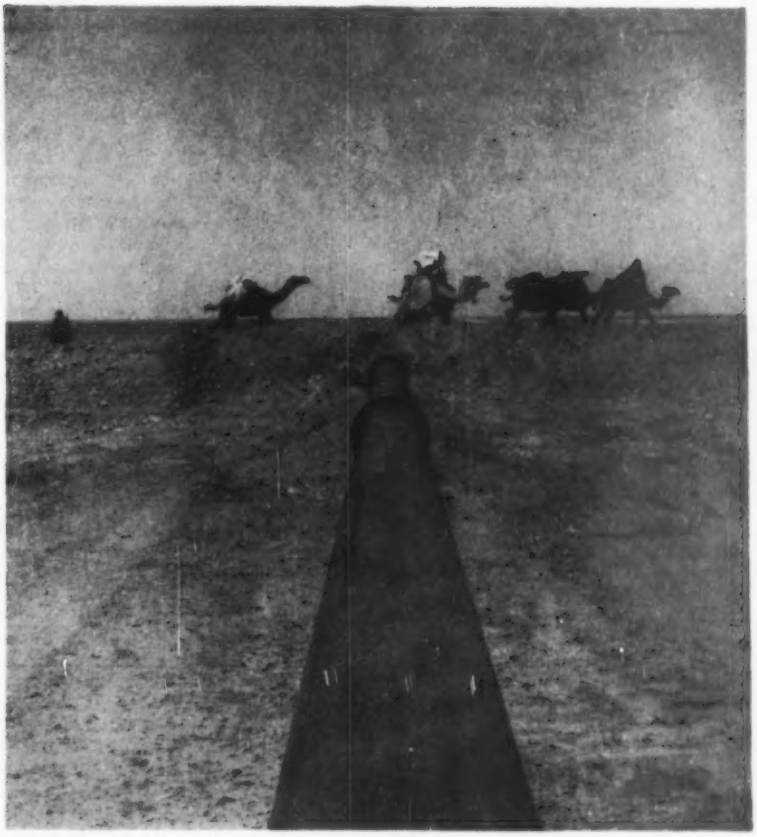
The lowest oil temperature recorded to



Interior of Badanah pump station showing part of power equipment. Photo by Richard Finnie for Bechtel.

Radio room at a Tapline station. Radio telephone and radio teletype system links all stations and terminals.

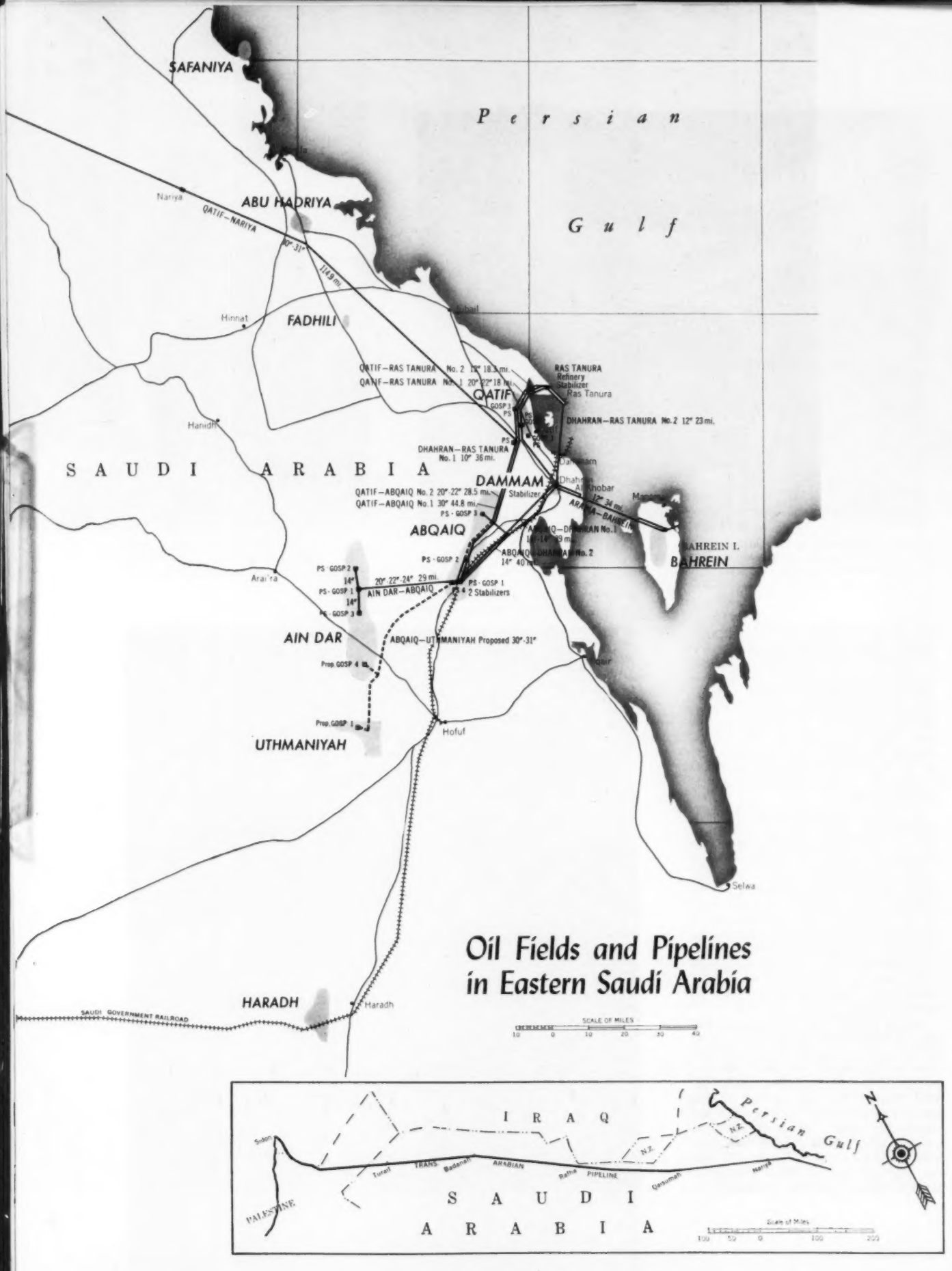
Land bridges were built across above-ground portions of the line at caravan crossings.



date is 42° F. during January, whereas during August, oil temperatures as high as 142° F. were measured. Seasonal swings in temperatures result in a line capacity of slightly over 300,000 b/d during the winter months and slightly under 330,000 b/d during the summer months. Also, the throughput is affected by changes in viscosity and gravity of the oil. To date it has dropped slightly due to heavier oil being received from the Aramco system.

An interesting phenomenon resulting from the use of the above-ground line is that of the "arch hydraulic gradient." During the portion of the day when oil in the line is heating, the oil expansion results in higher pressures and an upward arching of the gradient. At night when the oil is cooling, the gradient curves downward. Spot checks along the line indicate swings above and below the straight line gradient of 35 psi. The magnitude of the arch is a function of the rate of temperature change, which has been recorded as high as 11° F. per hour.

During the first year of operation, less than 24 hours downtime was experienced due to pipe line repairs. A research program to determine the most effective method for repairing the pre-stressed relatively high C-Mn pipe resulted in the almost exclusive use of welding rings and sleeves for repair. To minimize stress concentration, only girth welds have been used on the main pipe in conjunction with the rings and sleeves. When welding on the line during operation, preheating is



Oil Fields and Pipelines in Eastern Saudi Arabia

Part of the tankage at the Sidon terminal. Elevated striped tank is used for fresh drinking water storage.

Aerial view of the desert pump station at Qaisumah, Saudi Arabi.

performed to minimize the rapid cooling and embrittlement of the weld and heat affected zone.

Tankage at the Sidon Terminal is located in the foothills about 6,000 feet from the shore line and at elevations of from 280 to 370 feet. Gravity loading to ships is accomplished through submarine lines to four moorings located about one mile offshore.

Only thirteen 180,000-barrel tanks were available for crude oil service initially. This proved to be insufficient storage to allow maximum pipe line throughput during periods of winter storms and tanker unavailability. Consequently, additional tankage is being added to bring the total to twenty 180,000-barrel tanks. Also a fifth submarine berth was constructed for use when tankers arrive in clusters, as occurs in periods after storms. Ship loadings of over 600,000 b/d have been accomplished frequently with four berths so five berths should provide facilities for handling 750,000 b/d with a potential peak capacity of one million b/d.

One of the unique installations at the terminal is a friction tube assembly which reduces the incoming line pressure from over 500 psi to the tank manifold pressure of about 50 psi. This relatively high incoming pressure results from a steep descent in ground elevation at the terminal approach and an operating practice of maintaining a "packed" line at all times. The operation of the friction tubes has been extremely successful. They are quiet in service and show virtually no wear or erosion after a year of operation.

All the terminal oil handling facilities are operated from two control boards. One board is located at the tank farm and handles the incoming oil and switching of tanks. The second is located at the shore and controls the ship loading. These boards are being operated entirely by Lebanese personnel and have proven most successful. American operating supervision is confined to the shift foreman level and above.

Radiotelephone and radioteletype communication are used between pump stations, the Sidon terminal, and the Beirut headquarters. The system utilizes high frequency between the stations and the terminal, and VHF between Sidon and Beirut. Also, a ship-to-shore marine radio station has been in operation since August 1, 1951. At present, additional radioteletype facilities are being installed for the dispatch circuit to insure a higher degree of reliability and help overcome the language barrier.

Tapline's construction embodied several previously untried features in oil pipelining which have been a success. Among these are fully restrained above-ground line, 30-inch and 31-inch pipe of ¼ inch wall thickness, and friction tubes to dissipate high back pressures. On the basis of experience to date, these innovations represent a major contribution to petroleum pipe line technology.

As part of its long-range program for operating the pipe line with employees from countries in which it does business, Tapline recruits professional and technical personnel in Lebanon. Tapline is one of the largest single employers in Lebanon and Lebanese are being trained to replace Americans to the greatest extent possible. Other nationalities of the area are employed at various points on the line as conditions require.

From the terminus of the pipe line at Sidon to its beginning at Saudi Arabia, Tapline has built a road, the first overland link between the Mediterranean and the Persian Gulf. Instead of camel caravans, large trucks operated by Middle East companies traverse this road to supply the pump stations and the villages which are springing up alongside the pipe line. Trucking techniques, learned during the construction period, are now being utilized by local enterprises in developing new markets in arid northern Saudi Arabi for the bountiful products of the Levant countries.

In Arabia, at Tapline's pump stations, the company personnel are required to perform many assignments far removed from pipelining. Doctors are called upon to do anything from administering first aid to treating any type of disease, all without charge. In addition, company doctors and engineers work together on sanitation and health problems of the embryo Arab communities growing alongside the pump stations.

Within the pump stations, on-the-job training courses, coupled with special classes in English and simple pipe line operating theory, are provided for the benefit of Arab employees. The Arabs are constantly being trained for better jobs. For the Bedouin, the transition is not easy from a nomad desert life to the relatively confining pump station life. Even so, Tapline has trained and employed local people in responsible operating jobs. It is expected that the overall training program will result in a continual advancement of local personnel in taking over more responsible positions within the company.

A SEISMOLOGIST'S VIEW OF WESTERN CANADA

By F. B. Leedy
Seismograph Service Corporation.

F. B. Leedy has been engaged in geophysical operations in a number of countries since he joined Seismograph Service Corp. in 1934. After working as geophysical advisor in Trinidad he was transferred to Argentina as party chief and SSC manager in that country. From 1943 to 1946 he was vice president and manager in Colombia and from there moved to the Bahamas for a three-year tour of duty. He went to Canada in 1951 as vice president, assistant treasurer and manager of operations in the Dominion.

DISCOVERY IN FEBRUARY 1947 of oil production in commercial quantities from a Devonian reef in the Leduc area southwest of Edmonton, Alberta, inaugurated a period of intense exploration activity which, over the past five years, has made Western Canada one of the most active areas of oil exploration in the world. Although oil had been produced in commercial quantities from the Turner Valley field in southwestern Alberta since 1914, as well as from a few other isolated fields, it was not until the Leduc discovery that the spotlight of the oil industry was focused on Western Canada.

The potential oil-producing areas of this region are indeed vast, extending in an east-west direction at the southern border from the Rockies in western Alberta to include southwestern Manitoba—a distance of about 800 miles. The east-west extent narrows to less than 200 miles at the northerly limits near the Arctic Ocean. In a northwesterly direction, the area reaches from the United States border to the Arctic, a distance of about 2,000 miles. This region is nearly four times the size of Texas.

At present, most of the prospecting is confined to the area south of the northern border of Alberta. From Alberta north to the Arctic Ocean, there are some 250,000 square miles of the Northwest Territories which no doubt will eventually be surveyed by geophysical methods.

Thus, Western Canada promises to remain highly active from an exploration standpoint for many years to come. In December 1951 approximately 150 geophysical crews were operating in the area, an increase of about 1,000 percent since 1946.

In general, the subsurface picture of this apparently rich petroliferous region reveals a large geosyncline which parallels the Cordilleran mountain front from Montana to the Arctic. From Montana northwest for at least several hundred miles, tremendous faults were overthrust in an easterly direction until the axis of the geosyncline is considered by some geologists now to be either under the foothills belt or even west of it. Ordovician beds in the basin trough may attain depths of over 13,000 feet. The east flank of the basin gradually pinches out northeastward against the Pre-Cambrian Canadian Shield.

Near the mountains, oil and gas are produced from sharply folded and faulted structures such as are found in the Turner Valley field. Pinchouts in Cretaceous sands up-dip result in strat-trap type fields such as Viking, Vermilion, and Lloydminster. Closed anticlinal or domal structures, so far of minor significance from a production standpoint, also occur in southern Alberta along the northern extension of the Sweetgrass Arch. However, the enormous Devonian reefs of the Leduc, Redwater, Golden Spike, Stettler and other fields are the latest and, at present, the most prolific source of production.

It seems worth pointing out that the recent recognition of domed, biohermal masses of similar age* outcropping near the shores of Lake Winnipegosis and Lake Manitoba in southwest Manitoba, suggests the possibility that they may occur and produce throughout a large part of the basin. This study also indicates the presence of Silurian Bioherms in the same area which should give added incentive to deeper drilling in the basinward direction.

One other occurrence of oil needs mentioning, although to date no commercial production has been derived from it. This is the area of the Athabaska tar sands which outcrop in the vicinity of Fort McMurray in northeastern-central Alberta near the Saskatchewan border. It has been estimated that this deposit contains as much as 300,000,000,000 barrels of oil. The sands are Cretaceous in age, but the source of the oil is believed by many to be from the underlying truncated Devonian sediments.

With the possible exception of the oil shale deposits of Colorado and Utah, this is one of the largest known undeveloped oil reserves in the world. However, no process for extracting the oil has been developed so far which can economically compete with the methods of production and refining in established usage. It is of interest to note that, recently, large areas of the tar sands outcrop have been leased by various Canadian and American operators with the intention of developing a process for extracting the oil in commercially marketable quantities.

The surface geology of almost the entire area, except along the foothills and, in some cases, in the larger river valleys, is obscured by a layer of glacial drift of extremely variable thickness. This creates

* Please refer to bibliography (2) at end of article.

Tough going for a jug hustler in the Faust, Alberta, region.

Lowering dynamite charge into shot hole. Imperial Oil Ltd. photo.

difficult problems for both the geologist and the geophysicist. The geologist is limited for the most part to information obtained from well or shothole logs, whereas the geophysicist is almost invariably confronted with the problem of making satisfactory near-surface corrections.

A large part of the area under exploration is comparatively flat, with very poor drainage. This is typical of many glaciated regions, and accounts for the semi-swampy conditions and numerous lakes. There are, however, large hilly areas quite remote from the foothills of the Rockies, yet having a relief of 1,000 to 3,000 feet above the surrounding plains.

Patterns shown on the surface by the lakes and morainal deposits ordinarily represent only the most recent period of glaciation. However, due to the fact that the region was glaciated a number of times, followed by a complicated sequence of fluviatile action, the present surficial material gives few clues as to what may be encountered by the shot hole drill.

As mentioned, some areas have been criss-crossed many times by glaciers of different age. Many stream valleys have been gouged out, whereas others have been filled. Also, the courses of some of the largest rivers have been shifted by glacial action. In the flat plains area, where relatively thin glacial deposits might be expected, the gravels sometimes reach a thickness of several hundred feet, while in morainal areas bed rock is sometimes encountered at depths of only 25 to 50 feet.

With the beginning of intensified exploration and the resultant influx of geophysical crews (mainly seismic) into the area, many problems became manifest. One of the first lessons that had to be learned by any newcomer was that traffic of materials, equipment, and personnel across the international border was almost as complicated as movement into any other Western Hemisphere country. This difficulty has been mitigated somewhat, mainly through experience, although the Canadian authorities have made some effort to relax the legal restrictions.

Probably the most notable difference to anyone coming from very far south of the the border is the change in climate. This factor, though sometimes more psychological than practically serious, has cropped up as a major problem in practically every phase of the oil industry. In Alberta, the winters are long and cold with mid-winter temperatures falling occasionally to more than 50 degrees below zero. Not many years ago, it was thought that temperatures of 10 to 20 below zero were too cold for satisfactory operations in the Mid-Continent area. For a time after the increase of activity in Alberta, 30 below zero was the accepted minimum for reasonable operation. At present, however, crews operate successfully and fairly efficiently at 50 to 55 below zero.

In most cases, the crew personnel now decide when it is too cold to work, the amount of wind often being the deciding factor. Actually, the ability to withstand the intense cold lies mainly in the knowledge of proper dress, and in the use of ancillary energy-producing foods. People who move to Canada from more temperate climates certainly do not freeze more easily than those born and reared near the Arctic Circle. On the other hand, they are more subject to freezing because they seldom know at first how to dress warmly and protectively, nor do

Track treads are required for even light vehicles when the thaws come.

Field camp of seismograph crew in northern Alberta.

The going gets a bit muddy at times in the bush areas. All photos with this article except as otherwise noted are reproduced through the courtesy of Stanley Wilcox of Seismograph Service Corp.

they realize either the ease with which body extremities freeze or the symptoms thereof.

Because of the extremes of climate, transportation problems are inextricably linked with seasonal conditions. Usually, the seasonal changes in the weather are largely responsible for time limitations on the areas that can be worked economically and, in particular, in the rate of progress of the crews.

Some areas are almost impassable for periods of three to six months every year. This, however, is not necessarily the same for all parts of the region. The "bush country" is most accessible in the winter months when the swamps and "muskeg" are frozen. During the same period, on the other hand, it is extremely difficult to accomplish anything on the Alberta and Saskatchewan plains due to high winds and continually drifting snow.

The hazards of travel, particularly during the long winters, are numerous, and those who have to travel in the more remote and uninhabited parts of the exploration zone must go prepared. Proper preparation should include carrying emergency equipment such as a small gasoline stove, a sleeping bag, food supplies, extra gasoline, waterproof matches, an axe, a shovel, and other miscellaneous tools. Commercial emergency kits also contain a compass, flares, fishing tackle with gill nets and a book of instructions on what to do or what not to do if one becomes stuck, lost or stranded.

In the summer much of the bush country is swampy and difficult to traverse, while the roads on the plains range from fair to good. Spring is a difficult time in all areas, while fall is the season when the largest percentage of acreage can be worked to advantage.

From Calgary to northern Alberta via road is about 800 miles, and to eastern Saskatchewan about 600 miles. The term "road" is used rather loosely since most of the main routes of travel are either not surfaced or have only a thin layer of gravel which is not very effective in keeping the roads in passable condition during thawing and rainy periods. Geophysical crews are often so far from headquarters that it is like having a crew in Denver and another in New Orleans with headquarters in Tulsa, and with nothing but gravel roads or bulldozed trails to travel over. When possible, airplanes, equipped with skis in winter and with wheels or floats during the other seasons, are used for the transportation of supervisory personnel and equipment repair parts.

The seasonal aspect of the operational problem is troublesome both to the oil companies and to the geophysical contractors. Many oil companies have the majority of their holdings either in the bush areas or on the plains. Only a few have the balance of acreage in these two types of areas to permit assignment of a year-round program providing for seasonal migration from one type to another. In any event, such a balance of acreage will not last long, since work generally progresses at a more rapid rate in the plains area. This general situation creates periods during which contractors have equipment standing idle, while at other times the demand for crews exceeds their availability.

Since early 1949 the trend of geophysical operations has been toward the use of specialized equipment in order to minimize the necessity for a seasonal migration from one type of area to another. Track-type units are usually employed in the bush areas, which has extended the time of operability to about ten months per year. Such equipment, however, has not been used very much on the plains, since the speed at which it can be moved between locations is much slower than for truck-mounted units.

Seasonal changes also create technical problems for the seismologist. During the winter months, the surface freezes to a depth of three to eight feet. In fact, in the northern part of Alberta, especially in the bush-covered or wooded areas, it is not uncommon to find permanent frost three or four feet below the surface. In the fall, as the frost progresses downward from the surface, no serious recording problems are encountered in ordinary terrain or in the semi-swampy "muskeg" areas. This may be partly explained by the fact that the fall season is generally the dry season, and less moisture is contained in the surface material then than at any other time of the year.

In general, the muskeg shoots better in winter than in summer, because there is sufficient moisture in the mat of vegetation on the surface to allow it to freeze into a rigid mass. In this state it will transmit energy almost as readily as the areas that are not swampy. In the summer it often becomes necessary to plant the geophones on pipes driven into the muskeg in order to transmit the energy from the more solid material below.

In the spring, as the thaw progresses downward from the surface, the records begin to deteriorate in quality in some areas, probably due to the high-speed layer of frozen ground immediately below the lower-speed layer of unfrozen ground. The records then resemble those obtained in areas where high-speed gypsum or limestone layers exist near the surface.

Gradually, as the thawing progresses, the records tend to improve.

In certain areas, records shot in the same vicinity in summer and winter often exhibit important character differences, even though each group may be graded separately as fair to good. The principal difference in such cases usually lies in the frequency differences in the recorded reflected energy.

Lakes, which in some areas are very numerous, present a different problem. Many of these lakes are very shallow (only a few feet deep), and freeze solid during the winter. In this case, recording operations can be carried out across them with little difficulty, and the records are usually as good as those obtained elsewhere in the same general vicinity. However, if much water remains below the ice, practically no usable records can be obtained, since the shots, whether originating on the shore or in the lake, start tension cracks in the ice. This cracking may continue for several seconds after a shot is fired, and produce noise at a much higher energy level than the reflected energy. Repeated shots do not seem to dissipate the tensions thus set up to any great extent.

The refraction breaks under these varying conditions are frequently affected by stringer breaks, so that summation type weathering calculations are often impractical or even impossible. For this reason, a large percentage of the seismic data is corrected to the base of the shot hole by means of the uphole time, and only the close-in geophones are used for depth computations.

The shot holes are drilled to bed rock, where possible, but in some places the glacial drift or low-velocity beds are 400 or more feet deep. In the hilly areas previously mentioned, surface difficulties are further accentuated with pockets of glacial material and fill attaining depths of 600 feet or more. In some places the larger river valleys are also partly filled, creating a rather wide zone in which seismic results are frequently very poor. Long refraction shots (up to two miles) have been used in some instances in an effort to correct down to the first high-speed bed.

Thus, it will be obvious why the surface problem is one of the most difficult to cope with in obtaining a satisfactory interpretation of the reflection data, since conditions vary widely not only from place to place but also with the seasons. As noted above, not only are the surface corrections subject to considerable error, but also the reflection quality is often poor or extremely variable.

As previously mentioned, the discovery of a prolific source of oil in Devonian reefs near Edmonton set off the oil boom in Western Canada. Almost immediately, geophysicists were requested to develop methods and techniques for locating reefs. Actually, the problem is not too difficult, providing the reefs are of considerable thickness and of comparatively high velocity with respect to the surrounding shale or interbiohermal facies.

From such a set of conditions, seismologists have several means of identifying a reef if usable seismograms can be recorded. These are:

(1) The thick shale section usually surrounding a reef results in draping of the upper beds on the flanks due to differential compaction.

(2) The higher velocity of sound which usually occurs through a reef mass produces an apparent but often fictitious structure in the beds below the reef.

(3) An interval time map between the upper and lower beds generally shows "thinning" in the vicinity of a reef.

(4) Rather sharp divergence is frequently in evidence between the upper and lower reflections off the side of the reef.

(5) Occasional partial reflections showing comparatively steep dip are sometimes seen on the records. These may come from the reef flanks where the surface is smooth enough to reflect energy, or from separations within the reef itself.

All of the above phenomena are observed on some reefs, but many reefs may not be of sufficient magnitude to produce conclusive results. It should be kept in mind that reefs such as Leduc, Stettler, Golden Spike, and Redwater, which produce prominent seismic anomalies, have thicknesses varying from 400 to 700 feet or more. However, when the errors of correcting for a very erratic surface condition are superimposed on a weak anomaly, it will be obvious that numerous reef structures may be missed.

In general, due to the erratic nature of the glacial drift, it may be stated that the probable error in seismic data is greater in Western Canada than that usually encountered in the Mid-Continent or Gulf Coast area of the United States. Some companies consider a seismic structure showing less than 20 milliseconds (approximately 100 feet) of closure to be unreliable.

Because of this unreliability in the data, most seismic interpreters have resorted to time interval maps, which are relatively unaffected by erratic weathering data, for study in conjunction with the regular time maps on the principal reflecting horizons. These isopachous studies aid immensely in the resolution of the seismic data. However, even the interval maps are subject to error because of the wide variation in the surface conditions. The ground filtering changes somewhat with the thickness of the drift, and also, as previously mentioned, with seasonal changes in the climate, thus varying the apparent frequency of the recorded reflections. Finally, satisfactory or reliable interval maps can be made only when approximately continuous reflected energy is recorded from the proper parts of the stratigraphic section.

The erratic nature of the data emphasized the need for a considerable amount of detailed shooting in the greater part of the exploration area. So far, however, geophysical detailing has been at a minimum in Western Canada except over the marginal areas of the producing fields such as Redwater and Leduc. The development of the region is still in the initial stages, with each operator burdened with large acreage concessions in areas difficult of access on which a certain amount of exploration and development must be done before a deadline date. In some instances, this has resulted in very poor quality geophysical work, due to the lack of time necessary to prepare properly for a difficult assignment and to the inability to interpret insufficient data. It is not unusual for a geophysical contractor to be asked to carry on a reconnaissance survey over a bush-covered, roadless area of 15 to 20 townships in a period of two to three months. About the best that can be expected, in such a case, is the shooting of a few more or less widely-scattered, unclosed traverses across the area on bulldozed trails. Seldom can a conclusive interpretation be made from such data.

While the above analysis perhaps sounds pessimistic and negative, it may be pointed out that many of the conditions mentioned occur in most new "boom" areas. Western Canada offers many problems for the seismologist to solve, the most common and troublesome probably being the near-surface correction. Continual experimentation is gradually solving many of the difficulties of communication, transportation and interpretation. The problems imposed by the weather are being overcome as experience is acquired.

It is definitely believed that, along with increased experience, detailed shooting and careful, thorough field procedures and interpretive techniques will allow the satisfactory mapping of practically all of the region.

Further, the oil operators and companies for the most part realize the difficulties and problems of the seismologist, and after the initial furor to get there 'fustest with the mostest' subsides, overall good quality geophysical results can be expected to follow.

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BY E. A. BELL

MINERAL OIL IN TURKEY

THE PRESSURE brought about during the late war in the supply of the Turkish market with mineral oil products prompted the oil section of the Mining Research and Exploration Institute (Maden Tetkik ve Arama Enstitusu) to intensify its oil prospecting activities and test drilling which had been in progress for some time in various regions of the country. The indications were that oil should be present in various parts of southeastern Anatolia as well as in Thrace (The European portion of Turkey).

Prospecting was concentrated in southeastern Anatolia, particularly in the Ramandagh district to the east of the town of Diyarbakir, that is, near the locality of Besiri on the northern slopes of the Tigris Valley. Prospecting there was extended in a northeasterly direction towards the Lake of Van. Exploratory work went on at the same time in the district of Cengan, near the port of Iskenderun (formerly known as Alexandrette, and located in the Hatay vilayet which used to be Syria's northernmost coastal strip before it was ceded to Turkey by the French).

Prospecting in the Cengan district was discontinued in 1948. Subsequently resumed, the work was reported as highly promising in April 1951. There was also some prospecting activity near Suveydiye, not far from Antakya (formerly Antioch) in the same vilayet, and it was believed that any oil deposit there should be somehow connected with the Syrian oil zone of Djis-eh, just across the frontier.

In the west, prospecting was actively pushed forward near Polatli, some 56 miles to the west of Ankara, on the Ankara—Eskishehir—Hiadar Pacha (Istanbul) main railway line. Test drillings near Polatli in 1944 yielded some 10 metric tons of crude oil. It was feared for some time that an earthquake which occurred locally in that region about a year before might have dislocated oil-bearing strata, but this did not prove to be the case. Evidence of oil deposits in the Eastern regions of Bismil and Silvan recently were reported by the Ankara radio. Other testing was done near Ismaye and in the Taurus mountain range, both in southern Anatolia, and between the town of Adana and the port of Mersin. In Thrace prospecting proved a failure in 1948.

The prospecting activities in all the areas named were the responsibility of the Research Institute. Financing was jointly undertaken by the Institute and the state-owned Eti Bank. The Eti Bank, with a share capital of Turkish Lira 150,000,000 ($1 = TL 2.8) is mainly concerned with financing the development of the country's geological riches. In this connection, it enjoyed a sort of monopoly up to the middle of 1950. The change of regime brought about as a result of the general elections of May 1950 has limited that monopoly, enabling private initiative to secure a larger part in the development of the country's mineral deposits. Law No. 5821 passed in August 1951 covering the furtherance of foreign investments in Turkey has opened important possibilities also to foreign interests.

The new law provides that foreign capital invested in Turkey will enjoy certain advantages and guarantees on condition that (1) it contributes to the development of the Turkish economy, (2) is used in fields normally open to Turkish private capital, (3) does not involve the granting of a monopoly, and (4) is invested in the sphere of industry, power, mining, public works, communications or the tourist trade. Since item four does not mention oil specifically, it is possible that legal clarification may be necessary, particularly of items two and three.

Oil finds of commercial proportions have been encountered in the Ramandagh area only. As mentioned before, the Ramandagh region is located to the east and northeast of Diyarbakir town in southeastern Anatolia. Its center, Besiri, is on the standard-gauge railway leading from Diyarbakir in the direction of the northern slopes of the Tigris Valley. Besiri is situated 76 miles east of Diyarbakir. The oil area there is about 40 miles long with a width of up to 10 miles.

First important showing of oil in Turkey was obtained in Raman No. 1 in 1940 although the well subsequently went to water. After a series of unsuccessful step-out tests, No. 8 was a good producer in the Turanian lime at about 4,500 feet.

TABLE I

IMPORTS OF MINERAL OIL PRODUCTS[a]

	Gasoline and Similar Products		Other Derivatives	
	Metric Tons	Value in £T	Metric Tons	Value in £T
1940 ...	45,614	3,630,000	39,990	2,316,000
1941 ...	46,403	3,642,000	47,642	2,569,000
1942 ...	27,117	1,959,000	18,637	875,000
1943 ...	39,056	2,741,000	26,990	1,276,000
1944 ...	55,765	3,918,000	32,887	1,436,000
1945 ...	38,999	2,863,000	42,401	2,107,000
1946 ...	66,569	5,239,000	45,627	2,681,000
1947 ...	95,883	9,571,000	64,238	5,685,000
1948 ...	141,105	17,411,000	81,081	9,596,000
1949 ...	193,287	25,364,000	111,052	11,766,000

[a] official government figures.

Some testing has been done in an effort to obtain production from lower horizons.

Commercial production of the Ramandagh field averaged 35 b/d in 1948. In 1949 output was 260 b/d; in 1950, 295 b/d; and in 1951, the average was 330 b/d. Early this year output was at the rate of 400 b/d. Potential was much higher, possibly about 5,000 b/d.

Production from the Ramandagh anticline is in a limestone zone about 200 feet in thickness. There is thought to be a water drive in the zone, but because of the high elevation of the well heads, the wells will not flow. Pumping is restricted in some wells because of the lack of adequate pumping equipment.

About half of the current production is processed at a local refinery which has a skimming capacity of about 150 b/d and the remainder is burned in its crude state by railway locomotives. The crude is about 20 API gravity and with a high asphalt content is useable directly as fuel.

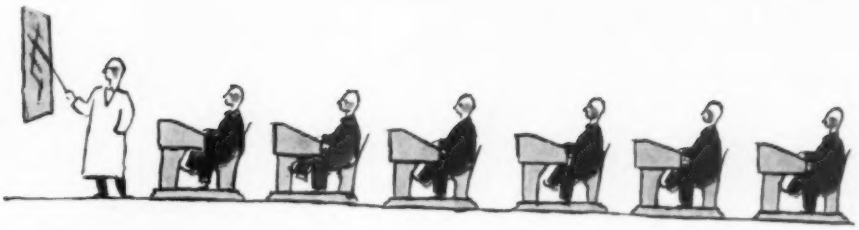
More recently it was announced in the Turkish Parliament that 17 wells have been drilled in the Ramandagh area of which six now are producing. In the nearby Garzan area three wells have been drilled of which two are productive. It was stated that production has risen to 600 tons daily, about 3,700 b/d. Either this was a spot test or much of this output must be going into storage because of the lack of refining capacity at Batman or the capacity of transportation and industry to consume the crude as such for fuel.

As to the future of the Ramandagh area, Turkish as well as American oil experts expressed themselves as being confident that production, once adequately developed, would suffice to cover the whole of Turkey's oil requirements for at least 20 years. Known reserves have been estimated at 35 to 125 million barrels.

The technical equipment at the disposal of the oil section of the Institute referred to above originated nearly exclusively in the United States. Turkish orders placed in the United States by the end of World War II totaled TL 2,000,000, and following the promising results obtained at Ramandagh, the Institute placed a further order to the value of TL 800,000,000.

Negotiations were undertaken in 1947 between the Ankara research institute and American interests seeking prospecting licenses in various areas in Anatolia. It was not surprising, however, that in view of the pronounced trend toward nearly ex-

(Please turn to page 112)



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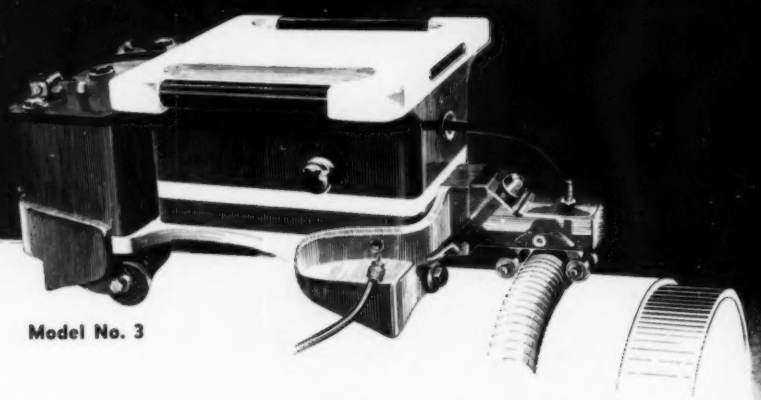

Model No. 3

The STEARNS ELECTRONIC HOLIDAY DETECTOR* is a device for making high voltage electrical inspection of pipe line coatings, above ground, as the unit is rolled along on the coated pipe by an operator. The complete Unit consists of the Generator coupled with an Alarm System, the Rolling Coiled Spring Exploring Electrode and Pusher Carriage Assembly. A small 6-volt storage battery serves as the power source.

THOROUGH INSPECTION

Fundamental precepts which are met by the Stearns Detector are:

(1) To generate a high voltage pulse of short duration regulated to hold the crest *intensity* within narrow limits irrespective of pipe size and the variable moisture conditions experienced during field inspection;

(2) To cause such a pulse to re-occur at a *rate* rapidly enough so as to have entirely traversed the coating surface with successive overlapping circumferential bands of ionization as the testing electrode is moved along the coated pipe;

(3) To *apply,* in a simple manner, these testing pulses to the coating by means of an exploring electrode embracing and self-conforming to the variable shape of the exterior of the coated pipe while being held in electrically effective contact with the coating surface at all times; and

(4) To give out audible and visual alarm signals as an instantaneous response actuated by the formation of a spark between electrode and pipe upon encountering a fault in the coating.

Under these principles the Stearns Detector in operation approaches the ideal in testing technique, with maximum safety to the operator, by providing thorough one-pass coverage while uniformly subjecting the coating only to the extent of electrical stress necessary to ensure complete inspection.

LIGHT WEIGHT

The Stearns Detector is fabricated from the lightest materials available having the required mechanical and electrical strength. The complete unit weighs 28 pounds—is 13.5″ long, 9″ wide, 7.5″ high. A welded magnesium case for the Detector, and a wooden box for two 10 pound 6-volt batteries serve as sturdy containers for storage and shipping. The complete shipping weight, including an overnight battery charger, is 75 pounds.

SIMPLE TO OPERATE

The Stearns Detector can be operated without special training or experience on pipes of all sizes. The proper output voltage is set before shipment and the regulation is thereafter automatic—all functions of the Detector being controlled by a single 'On'-'Off' switch. The patented pulse generator, which makes possible such automatic voltage regulation, is an exclusive feature of the Stearns Detector.

DEPENDABLE SERVICE

The Stearns Detector has been developed through eleven years of field experience and continued research and has become the Standard of the Industry. All major parts of the high voltage generating circuit are custom built for their specific functions and fitted together into an electrical assembly of proved dependability. Users of Stearns Detectors are constantly ensured of receiving equipment in new condition as a result of the rigid shop and laboratory maintenance procedures followed by The D. E. Stearns Company.

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Israel looks to oil possibilities

ENCOURAGED by a survey made in 1951 by Max W. Ball and Douglas Ball which indicated the existence of conditions favorable to the accumulation of oil in various parts of Israel, a bill was introduced into the Knesset (Parliament) on July 7 defining the conditions under which exploration for oil can be undertaken by private companies.

Declaring that all mineral rights to property within the country are the property of the state, the bill sets forth the terms and procedure under which these resources may be developed. Administration of the proposed law is to be in the hands of the Petroleum Commissioner appointed by and responsible to the Prime Minister. He will be advised by a board of three government officials and three public members, but decision by the Minister is final in all matters except that cancellation of leases for nonperformance may be appealed to the courts.

Preliminary investigations, including geology and geophysics, but not test drilling, may be carried on under nonexclusive preliminary permits issued by the Commissioner for such areas and with such conditions as he may think fit.

Licenses may be issued by the Commissioner with approval by the board to explore, drill, to receive a lease after making a discovery and to produce petroleum after discovery before receiving a lease.

No single license may exceed 400,000 dunams (100,000 acres). No licensee may hold more than three licenses, or more than 1,000,000 dunams (250,000 acres) in one district. An annual license fee of five Israeli pounds per 1,000 dunams (about $5 per 250 acres) is payable in advance.

Leases are for three years with possible extensions, either before or after discovery. Drilling must start within two years and continue "with due diligence" with not more than four months interim between completion of one well and beginning of another.

A licensee who makes a discovery is entitled to a lease on an area selected by him, not exceeding 250,000 dunams (62,500 acres). The lease conveys the right not only to explore for and produce oil, but also to construct pipe lines for transportation, to refine, export, import and trade in petroleum products. Royalty is fixed at 12½ percent of the oil produced, excluding fuel used on the lease. The Minister may require oil of domestic origin to be applied first of all toward meeting Israel's requirements and the Commissioner may direct the unitization of properties within a field if conditions make such a course desirable.

The Ball report on the geology of Israel and the possibilities of oil production outlines eight geologic provinces as follows:

(1) The Dead Sea-Wadi Araba graben, with faulted anticlines and "half-anticlines" along its borders and with possible salt domes in the valley itself;

(2) The Negev, striped with long anticlinal folds on which are numerous domes;

(3) The foothills belt, with surface evidence of anticlinal folding both oblique and parallel to the Judean-Ephriam arch;

(4) The coastal plain, in which gravity surveys indicate anticlinal folding;

(5) The Carmel uplift, a horst on which are two anticlines;

(6) The Emeq, a graben in which the down-faulted folding and faulting of the older rocks is concealed with Recent and Pleistocene sediments, with a few Miocene and perhaps Plio-Pleistocene volcanoes near the eastern end;

(7) The upper Jordan rift valley, the northern extension of the Dead Sea-Wadi Araba graben; and

(8) The Galilee highland, a faulted area of tilted blocks, graben and horsts with many faulted anticlines and "half-anticlines." Parts of the country lie in a ninth province, the Judean-Ephriam arch, but these are so small that they are included in adjoining provinces.

"Sedimentary beds," says the report, "range from early Paleozoic to Recent and fall into three main divisions:

(1) upper clastic, Recent through Oligocene, terrestrial with numerous marine members;

(2) middle calcareous, Eocene through Upper Cretaceous, almost entirely marine; and

(3) pre-Upper Cretaceous, interfingering terrestrial sandstones and marine beds with the marine percentage increasing northward and westward from about 15 percent in the southernmost Negev to 70 percent or more in the northwestern Negev and thence northward.

"Total sedimentary thickness is probably 3,000 to 7,000 feet in the southern Negev, 7,500 to 12,000 feet in the northeastern Negev, and 12,000 to 20,000 feet in the northwestern Negev and the rest of the country.

"Bituminous beds are widespread, a few of them high in organic content. Gas and asphalt eruptions in the Dead Sea have been famous since the dawn of history. Asphalt impregnations and live seepages are numerous in the rifts bordering the Dead Sea graben. In the southern coastal plain is a gas seepage with asphalt impregnation and a sulfur deposit. A water well near Saqiya in the central coastal plain got a substantial flow of gas in the Pliocene beds at 517 feet. Small asphalt veins have been reported in the northern Negev, in the northern foothills belt, and in eastern Galilee. Asphalt has been mined intermittently for 100 years in Syria, 14 miles from the northern Israel border. Farther away, but in beds that occur in Israel under similar structural conditions, oil and asphalt seepages are found in Lebanon and Turkey to the north; small oil fields with high saturations per acre have been found along both sides of the Gulf of Suez to the southeast.

"Only one well has been drilled for oil in Israel. Located near Huleiqat in the southern coastal plain, it stopped at 3,464 feet, probably in the Cretaceous, leaving 8,000 to 16,000 feet of sediments undrilled. Dip readings indicate that it was off-structure at depth. A well at El Khabra in Sinai, eight miles from the Israel border, drilled to 10,282 feet and stopped in the Jurassic without encountering oil. Dip readings indicate that it too was off-structure at depth. Several thousand water wells have been drilled throughout the country, less than 100 as deep as 1,000 feet, with only the Saqiya well encountering oil or gas. Ten core holes have been drilled for geologic information in the Dead Sea area; two of them were drilled through thick impregnations of live asphalt. Otherwise the country is virgin territory, waiting to be tested.

"Each of the geologic provinces has oil

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Shell refinery at Vancouver, B. C., which is to undergo a $10 million expansion.

Trans Mountain Pipe Line to Increase Capacity

TRANS MOUNTAIN Oil Pipe Line Co., whose pipe line from Edmonton to Vancouver is slowly winding its way to the Pacific Coast terminus, has decided to increase the initial capacity of the line of 120,000 b/d. Originally it was planned for a starting capacity of 75,000 barrels.

Robert L. Bridges, president of Canadian Bechtel Ltd., which is building the line for Trans Mountain, said that new oil discoveries since the plans were drawn, together with the possibility of further discoveries before it is completed in 1953, provide the reason for increased throughput.

To boost the capacity of the 700-mile line, an extra pumping station will be added. First plans called for two pumping stations, one at Kamloops and the other at Edmonton. The third station will be built at Marlboro about ten miles west of Edson, Alberta.

Cost of the three stations is estimated at $4 million. Mannix Ltd. of Calgary has been awarded the contract for construction of the stations. Materials, pumps and engines will be furnished by Trans Mountain and installed during the coming winter by the contractor.

Construction is already under way, the main objective being the erection of the pump house buildings so work of setting pumps may be carried out during the winter. Clearing and grading operations started in the latter part of July. Atlas Construction is doing the Kamloops work, Mix Brothers the Edmonton clearing and grading.

Contract has also been awarded for grading, drainage and road building and for construction of firewalls and tank foundations at the 200-acre tank farm in Burnaby. The job, valued at $280,000, has been given to Holmes and Wilson, Vancouver. Completion is set for late November.

With the 24-inch line snaking its way to the coast, plans are being made to carry it across its greatest water hazard, the Fraser River at Port Mann. Of the 60 rivers and creeks the line crosses, the Port Mann crossing is the largest.

Missouri Valley Canadian of Winnipeg has been awarded the contract for laying the pipe at Port Mann, and B. C. Bridge and Dredging Co., Ltd., of Vancouver, has the subcontract for excavating and backfilling across the river bed. The dredging company will use its 24-inch hydraulic dredge on the job.

Total length of the crossing is 5,700 feet. To reach the river the pipe will have to go under the Canadian National Railway tracks in the Port Mann yards. This will be done without interrupting train service. For 300 feet under the tracks the line will be encased in larger pipe for added protection.

Distance across the Fraser at this point is 2,250 feet and the 24-inch, half-inch thick pipe will have a continuous coating of extra heavy coal tar enamel reinforced with Fiberglas, the whole being protected with asbestos felt.

The wrappings will be covered with 2½ inch continuous concrete coating to help protect the pipe and give it sufficient ballast to keep it below the river bed.

The concrete covering will weigh 197 pounds per foot. Pipe will be buried a minimum of 15 feet below the river bed. Work on the river approaches started the end of August. Dredging will start in the late fall when the river level is low. It is expected the entire job will be completed this coming winter.

While construction of the Trans Mountain line and plans for construction of a natural gas pipe line by Westcoast Transmission have occupied the petroleum spotlight in British Columbia this summer, exploration and drilling activity have reached a new high.

As nearly all available land in the Peace River area is taken up under lease and permit, geologists are exploring other sections of the province and additional permits are opening up new areas.

A deep test well is planned in the Prince George area of north central British Columbia by Lee Carlson Oils which holds 230,000 acres there. W. B. Miller of Lee Carlson says the test is planned within the next six months. Approximate center of the acreage is the junction of the Willow and Fraser Rivers.

The Monkman Pass district will be the scene of an active fall drilling program. Work crews are strengthening 25 miles of road into the Stony Lake region where Wilrich Petroleums and Associates plan to drill on 530,000 acres. The well sites are 20 miles from the top of the pass in the Lone Mountain area.

United States Smelting, Refining and Mining Co. of Boston has registered in Victoria under the companies act, a legal phase in that company's participation in oil exploration in British Columbia. U. S. Smelting is one of the five firms in a joint oil and gas venture covering 1,500,000 acres in northeastern British Columbia. Spudding in of the first well took place early in August at a site 40 miles west of Nelson Forks.

Exploration interest has also been renewed in the Cariboo area where the Department of Lands reports lease applications covering more than a million acres. In the Smithers district exploration is planned on 700,000 acres.

None of the major oil companies has made applications in this field, most of the interest stemming from small firms and individuals. At the end of July, applications were in process in the Cariboo. Seven active permits covering 172,696 acres were registered previously. Smithers area exploration centers around Fran-

(Please turn to page 104)

Announcement by

Anglo-Iranian Oil Company, Limited

IN ORDER THAT there should be no misunderstanding as to the scope and effect of the recent decision by the International Court of Justice in respect of the Iranian oil dispute Anglo-Iranian Oil Co., Ltd. wishes to bring the following statement to the attention of all concerned.

It has already been made clear that the decision of the International Court is not a decision on the merits of the case and that it does not in any way affect the Company's claim that the Iranian Government has acted illegally towards the Company in Iran. The decision means simply that the International Court, which only has jurisdiction to the extent that individual states have either generally or in a particular case accepted the jurisdiction of the court, has decided after considering the arguments advanced by both sides that it has no jurisdiction in this case.

The Company's title to crude oil and oil products derived or to be derived from the area of its operations in Iran is in no way affected by the decision. In attempting to deprive the Company of this title and appropriating to itself the Company's properties in Iran the Iranian Government has acted in complete disregard of its solemn obligations to the Company and of the basic principle of the sanctity of contracts—a principle which is essential for maintenance of the necessary confidence for the continued development of world trade.

In these circumstances the Company remains confident no oil company of repute nor any tanker owners nor business men of standing will countenance any direct or indirect participation in the unlawful actions of the Iranian Government.

Should, however, any concerns or individuals participate directly or indirectly in transactions affecting the crude oil and refined products concerned this Company will take all such action as may be necessary to protect its rights in any country.

ANGLO-IRANIAN OIL COMPANY, LIMITED

Britannic House, Finsbury Circus,
London, E.C.2, England

German Production Rises Toward 2,000,000 Tons

By A. M. Stahmer

CRUDE production in Western Germany continues to increase with gains in output from established fields and some promising discoveries. An estimate by the Wirtschaftsverband Erdoelgewinnung (Association of Crude Producers) of Hannover forecasts a further rise to 1,638,370 tons in 1952, 1,817,980 tons in 1953, 2,014,700 tons in 1954, and 2,089,400 tons in 1955.

These figures anticipate rising yields from newly discovered fields of 9,600 tons in 1952, 80,000 tons in 1953, 250,000 tons in 1954 and 350,000 tons in 1955. If one reflects that the field Hemmelte-West, which was discovered late last year, and the recent find on the western flank of the Heide oil structure will be included in these future operations, the anticipated yields do not appear unreasonably high, all the more so since every year new productive areas are added.

Although for 1952 the Hannover area is expected to be the largest producer, it is anticipated that the Emsland fields will have left Hannover far behind by 1955. In comparing last year's yields with the figures expected for 1955, it can be seen that in the Hannover district there will be a marked rise in yields from the fields Suderbruch, Eldingen and Hohne, which by 1955 will probably be the largest producers in this area. It is true, however, that Suderbruch is expected to have reached a peak production of 170,000 tons as early as 1953. For the small field Etzel, the outlook is also good. On the other hand, a decrease is anticipated in old fields such as Neinhagen-Haenigsen, Steimbke, Wesendorf, Fuhrberg, Thoeren, Hademstorf, and Moelme. In the Quakenbruck field, which was discovered only in 1950, production is carried on under difficult conditions and probably will go down. Eilte, Ehra and Calberlah are likely to be nearly exhausted. Output from the fields Broistedt and Wiestze is expected to remain steady.

In their deviated well Hohenwoehrden 2a on the western flank of the Heide oil structure, Deutsche Erdoel-A.G. (DEA) has found oil at a depth of 1,809 meters in the standstone of the Wealden. Preliminary production tests resulted in a flow of three cubic meters per hour through a six millimeter choke.

In two respects this new find is of significance. First, the attempts to test the oil possibilities of the western flank of the Heide structure, which had been going for a long time and included the off-shore well Helmsand 1 sunk last summer, have at last been crowned by success. Hitherto, the Heide oil came from the cap rock of the salt dome only. In the second place, this is the first instance of oil being found in Schleswig-Holstein in the Wealden horizon of the Lower Cretaceous, which plays such an important part in the production of crude in the Hannover district. Coupled with the fact that a flank deposit was explored, this has opened new vistas for prospecting activity in Holstein, particularly on the North Sea coast in the Dithmarschen province and around Cuxhaven.

In the original Hohenwoehrden well oil traces had been found in porous rocks of the Wealden and the underlying Dogger. A production test, however, yielded nothing but salt water; apparently the well had struck the edgewater line. From a depth of 1,200 meters, the well was drilled at a deviation of 24° and met the top of the Wealden 100 meters higher up.

About 10 kilometers north of Hohenwoehrden, the well Weddingstedt-1 is being sunk for the purpose of testing the western flank of the Heide deposit.

Saulgau-1, a wildcat drilled by Deutsche Schauchtbau on its concession in southern Wuerttemberg to test the geological situation of the lower Molasse layers, found heavy oil impregnation in the sands and limestones of the lower Suesswassermolasse. On the strength of oil films encountered at 547 meters, bailing tests were made which for the first time in the South German Molasse basin yielded more than 10 gallons of crude, sufficient to ascertain the chemical and technical properties of the oil. The find justifies the hope that commercial oil deposits may be found later on, provided well-closed structures are discovered.

Exploration is to be continued in the western part of the structure where it is hoped that the oil-bearing layers can be met in a somewhat higher structural position. Seismic investigations are under way preparatory to the drilling of further wells.

The well Itterbeck 2, sunk by C. Deilmann Bergbau GmbH on behalf of the group Deilmann / Gewerkschaft Elwerath / Preussag / Wintershall, struck gas in the Platten dolomite of the Zechstein at a depth of 1,306-1,321 meters. The first analysis showed the gas to have a methane content of 89 percent with no traces of H_2S.

The well is situated close to the Dutch border, about five kilometers south of Uelsen. A short distance east is the well Itterbeck-1 in which gas traces also were found. A production test is to be carried out in this well shortly.

As yet it is uncertain whether the discovery at Itterbeck is a proper gas deposit or a gas cap on top of an oil deposit. A flank well is to be drilled to find out. Meanwhile, it has been reported from Holland that the well Denekamp, which is located on the Dutch part of the Itterbeck structure, has definitely struck gas in the Platten dolomite of the Zechstein.

The positive results of the gas wells of Itterbeck, Frenswegen, and Rheden, and the discovery of an oil deposit at Hemmelte constitute an incentive to wildcatting in the area between the Dutch border and Diepholz.

In 1951, oil refineries in Western Germany turned out a total of 4,560,695 tons of finished products, 42 percent more than in 1950. German refining capacity has nearly reached the level of inland consumption so that only supplementary quantities of finished products have to be imported. Thus, in the Federal Republic, the main goal of the OEEC program has been reached.

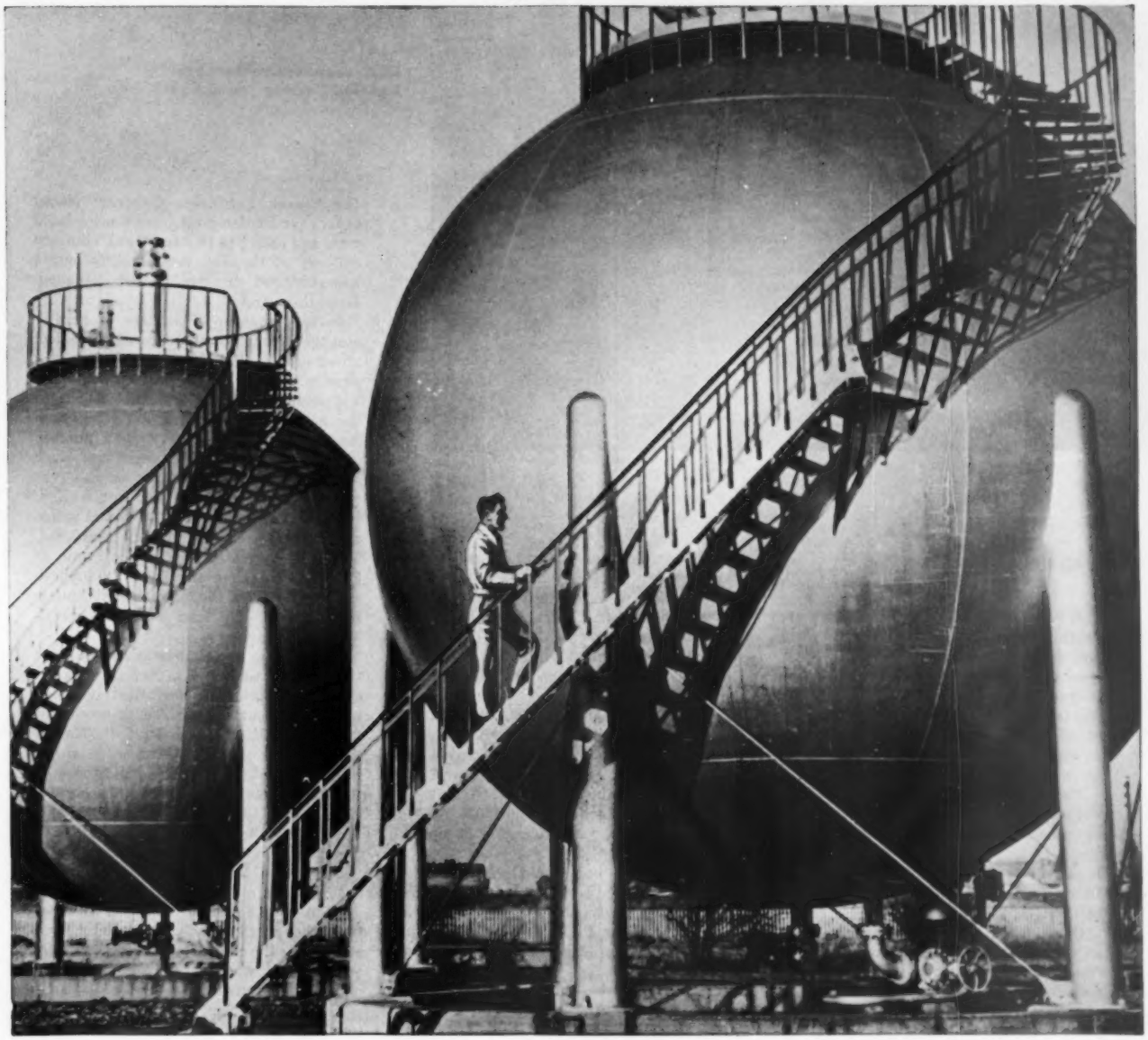
Of the total of 4,666,821 tons of crude oil processed in 1951, 28.5 percent came from German oil fields. At 161,017 tons, losses during refining were relatively smaller than in the previous year.

German shipyards are feeling the effect of the world wide demand for added tanker capacity. Through its subsidiary, Waried Tankschiff-Rhederei GmbH, Esso A.G. has placed an order with Deutsche Werft of Hamburg-Finkenwerder for a 26,650 dwt turbine tanker. This vessel, which is to sail under German colors, is the largest vessel to be built in a German shipyard since the war. The tanker will have 12,500 hp and a speed of 17 knots.

The Anglo-Saxon Petroleum Co., Ltd. has placed an order with Deutsche Werft for the construction of two 15,000 dwt tankers especially designed for transporting bitumen. This is the first order that Shell has placed for construction of bitumen tankers of this size.

The tankers are to have 6,000-6,600 hp and a speed of 14¼ knots. Their measurements are to be: length 154 meters, beam 20 meters, height at sides 11 meters, draught nine meters. The hold is to have 10 tanks which will be heated by fuel oil to keep the bitumen liquid. A temperature of 130° C is necessary for unloading. It is expected that both tankers will be completed by June 1954. They will sail under Dutch colors.

Hitherto the Anglo-Saxon Petroleum Co. has had three special tankers (Lembulus, Liparus, and Labiosa, 9,500 dwt each) transporting bitumen to Europe. These vessels use only their center tanks for carrying bitumen, the outer tanks being used for transporting fuel oil. They can carry approximately 4,100 tons of bitumen and 4,000 tons of fuel oil.



GLOBAL OPERATIONS...

Symbolic of Anglo-Iranian's global operations are these Hortonspheres in the Company's refinery at Grangemouth, Scotland. By 1953 the throughput of Anglo-Iranian's four refineries in the United Kingdom will be over 200,000 barrels a day—a valuable contribution to the country's increasing refinery capacity.

In Australia, plans are going ahead for the construction of the largest refinery in that continent. Throughout their existing overseas refineries, Anglo-Iranian and its associated companies are rapidly increasing throughput to meet the world's demand for petroleum products.

THE BP SHIELD IS THE SYMBOL OF BP THE WORLD-WIDE ORGANISATION OF

Anglo-Iranian Oil Company
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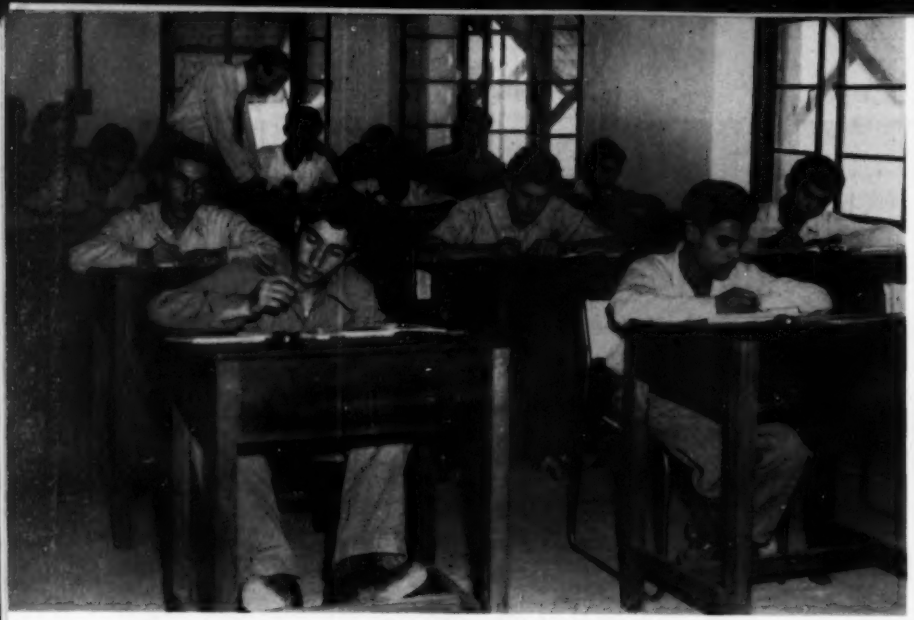
REPRESENTATIVE IN U.S.A.: W. D. HEATH EVES, 610 FIFTH AVENUE, NEW YORK 20, N.Y.



Classroom of apprentices at the Technical Training School, Kirkuk, Iraq.

Iraq Petroleum Co.

(Continued from page 79)

With these increased facilities the production from the Iraq and Mosul fields will increase to 22,000,000 tons *per annum* (450,000 barrels daily) by 1954, and it is estimated that a tanker fleet of 2,750,000 tons will be required for the transport of all crudes delivered to the terminals at Banias, Tripoli and Fao when they are all in full operation.

The major event of this year was the negotiation of a new agreement, ratified by the Iraq Parliament in February 1952, which revised the concessions given to the Iraq Petroleum Co. in 1925, to the Mosul Petroleum Co. in 1932, and to the Basrah Petroleum Co. in 1938.

On April 7, 1951, the companies made an offer to the Iraq government to share equally with the government the profits accruing from the operations of the three companies in Iraq. This offer was accompanied by specific proposals for its implementation and on August 13, 1951, the Prime Minister, His Excellency Nuri Pasha El-Said, announced the government's acceptance of the offer.

The Iraq government is assured in all circumstances that its total income will not be less than 25 percent of the seaboard value of all oil exported by IPC and MPC, plus 33⅓ percent of the seaboard value of crude exported by BPC. Fluctuation of world prices is to be taken into account in ascertaining the profits to be shared between the Iraq government and the oil companies. The Iraq government, as part of its share of the profits, will be entitled to take in kind at seaboard 12.5 percent of the oil produced for export by the three companies. The government can either dispose of this oil in the open market or receive its value at prevailing world market prices. A large part of the government's revenue will be received in the form of income tax.

Subject only to circumstances beyond the control of the companies, the Iraq government is guaranteed that its share of the profits shall not be less than £20,000,000 sterling ($56,000,000) in 1953 and 1954, and not less than £25,000,000 ($70,000,000) in 1955 and each year thereafter.

The government's interests are further safeguarded by the provision that, in the event of production of oil being precluded by circumstances beyond the control of the companies, they will pay the Iraq government a minimum of £5,000,000 ($14,000,000) annually for a period of up to two years.

Provision has been made to increase the opportunities of Iraqi nationals to participate in the development of the country's oil resources, and the number of Iraqi directors on the boards of the companies will be increased.

The profits from the companies' operations, of which the government will receive half, will vary on the basis of prices and costs prevailing from time to time. On the basis of current estimates, the Iraqi share of the profits provides for the Iraq government an expectation of revenue from this source of £31,000,000 ($86,800,000) in 1952, rising to nearly £60,000,000 ($168,000,000) in 1955.

The government has announced its intention to set aside 70 percent of these revenues for the projects of the Iraq development board, including flood control and irrigation schemes, schools, hospitals and other amenities which will raise the standard of living of the Iraq people.

Basrah Petroleum Company's concession was granted on November 30, 1938, for a period of 75 years. Geological exploration commenced immediately and by the outbreak of World War II a large amount of work had been done in the Amara area, but the outbreak of war put an end to this activity.

Before the end of the war, however, the Basrah Petroleum Company placed orders for British-built Ideal Consolidated rigs, and owing to this foresight, obtained delivery of the first deep drilling outfits manufactured in the United Kingdom after the war.

In the meantime, as there is neither seepage or surface evidence of geological structures at Zubair, an intensive geophysical survey, using gravity, magnetic and seismic methods, was carried out in the southern portion of the concession. As a result of these surveys, a number of potential oil-bearing structures were located, of which the only surface expression is a very slight rise in elevation, the area being covered with recent sands and gravels so that no geology is exposed. The most promising of these were at Zubair, Nahr Umr and Ratawi. Drilling commenced with the new rigs at Zubair in February, 1948, and at Nahr Umr in March, 1948.

The drilling at Zubair was located near the crest maximum of a very gentle anticline trending north northwest to south southeast about 20 miles, south southwest of Basrah. It was completed in March, 1949, having proved the presence of oil in commercial quantities in sandstones of the Cretaceous at depths of between 10,000 ft. and 11,000 ft. (nearly two miles). A second well located 10 miles south of the discovery well was also successful.

It was then decided to develop the area around Zubair No. 1 for an initial production of 2.5 million tons *per annum*, for although the first well at Nahr Umr struck oil, the second encountered water. Development was therefore concentrated on the Zubair area.

Six drilling rigs were employed, the total footage drilled to the end of 1951 being 202,424 feet, of which 90,833 feet were drilled in 1951. Seven wells were completed during 1951, and at the end of the year five more were drilling. Fifteen producing wells comprise the original production scheme, and the production from them is led to a single de-gassing station where horizontal separators will stabilize the crude. The oil and its associated gas flows through individual high pressure flow lines from the wells to the station, where gas is released in five stages at reducing pressures and the oil passes to the flow tanks. From the flow tanks it is pumped to storage tanks and from there pumped to the terminal at Fao through the 72-mile 12 inch pipe line by four gas-driven and two diesel driven pumps. The line is laid on eight-foot concrete sleepers, expansion and contraction being compensated for in the vertical plane.

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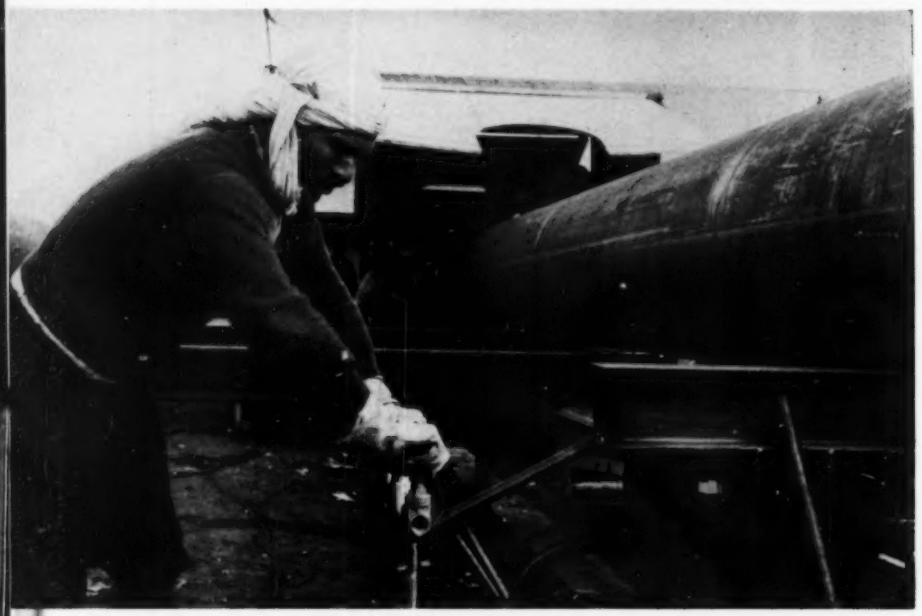
Instrumentation

Iraq Petroleum Co. *(Continued from page 102)*



Iraqi workman operating pipe cleaning machine during construction of new pipe line to the Mediterranean.

Eight storage tanks have been erected at the Fao terminal, each with a capacity of 4.25 million gallons (118,000 barrels). Two loading jetties have been built. Loading is by electrically driven pumps by which tankers can be loaded at the rate of 2,000 tons per hour. Lighting is provided for night loading, and fresh water and steam are available from tankers. The first tanker was loaded at Fao on December 19, 1951, nine months ahead of the original schedule.

Development is so far advanced on this field that it is now possible to visualize an annual production of 8,000,000 tons from the end of 1955. The expenditure incurred on this project up to the time the first loaded tanker left the jetty was over £18,000,000 ($50,400,000).

To cope with the increased production, a new 24 inch pipe line is projected from Zubair to Fao, the cost of the pipe alone for this line being over £900,000. The pipe is being manufactured by the South Durham Steel and Iron Co., Ltd., which manufactures the steel in its own open hearth equipment. It is the first time that oil line pipe of this size has been manufactured in the United Kingdom. Hitherto most of the large diameter oil pipe has been obtained from the United States.

A story on the construction and equipment of the new 30-32 inch Banias pipe line will appear in our October issue.

Trans Mountain Pipe Line

(Continued from page 98)

cois Lake, where 12 applications cover 660,000 acres.

Other British Columbia exploration data at the end of July showed 77 applications and active permits covering 1,750,000 acres.

Active permits totaled 433 permits, 30,173,689 acres; 125 applications, 4,558,956 acres. Peace River area led in drilling activity. There were 34 active "Crown petroleum and natural gas licenses" covering 195,840 acres and 17 drilling operations. One of these was the Toad River project of Central Leduc. The other 16 were Pacific Petroleums' Fort St. John operations. In the Kottenays there were six active drilling licenses on 66,911 acres.

An interesting development on the British Columbia petroleum scene is the announcement of Norman Whittall, president of Canadian Collieries (Dunsmuir) Ltd. that it is the intention of the company's board of directors to use some of the company's surplus funds in oil and natural gas developments in Alberta and northern British Columbia.

Mr. Whittall, as chairman of the board of Pacific Petroleums and a director of the Westcoast Transmission Co., has played an active part in the development of the province's petroleum resources.

Another of the Pacific Pete wells to blow is Fort St. John No. 9, which blew in July with great gas pressure spraying oil for 50 feet. Six miles southeast of Fort St. John the well struck gas and oil between 4,358 and 4,375 feet in the Triassic sandstone. Gas reached the surface in two minutes with 810 feet of gassy 37 degree API oil reported. Ten rigs are working near Fort St. John, eight of them by Pacific Pete. No. 9 well will head for lower objectives.

Gas in Fort St. John No. 4 was confirmed in a late July test of Permo-Pennsylvanian formation. Previously the well, 300 yards off the Alaska Highway, had produced gas at other horizons. Rate of the gas flow was set unofficially at 30 million cubic feet daily.

British Empire Oil Co. has become interested in 1,400,000 acres in northeastern British Columbia and has taken a 500,000 acre reservation in the Northeast Territories.

Principal item in the company's holdings is a 35 percent interest in the one million acre block adjacent to the route of Westcoast Transmission's pipe line south of Fort St. John.

Preliminary geological work is under way at Prophet River 80 miles southwest of Fort Nelson and three miles west of the Alaska Highway where Mill Creek Oil Co. has acquired a 97,600 acre permit. Van Tor Oils has moved a rig into an 11,520 acre area in Fort St. John and has an interest in a Flathead Valley drilling program with Wilrich Petroleums.

Washington Dateline

(Continued from page 69)

Aside from the legal approach, the Justice Department, according to reports not backed by official utterances, has quietly exerted itself to induce PAD to abandon two committees set up to study supply problems and has renewed the suggestion that the National Petroleum Council be reduced to the position of a mere appendage of the Interior Department.

Whether or not there was any connection with these developments, significance is attached to the timing of Deputy Administrator Warren's spirited defense of PAD and Secretary Chapman's assurance to the NPC that nothing in its activities was in the slightest degree in conflict with the established rules of government.

Two subjects of present concern to PAD are supplies of aviation gasoline and of jet fuel for military use during the remainder of the year. Its estimates are that current supplies of military avgas are about 50,000 barrels short of fuel requirements and that the jet fuel supply needs to be stepped up 5,000 barrels for September and a total of 5,000,000 barrels for the final quarter of the year. In view of the situation, Deputy Administrator Warren last month sent out urgent appeals to refiners to increase their production of both of these vital products. Prompt response by the companies has brought supplies into temporary balance.

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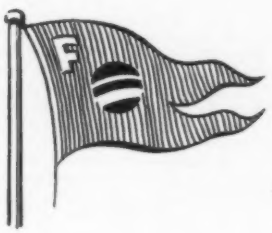

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INTERNATIONAL NEWS AND NOTES

Foreign Firms Consider Exposition Exhibits

Oil field equipment manufacturers in the United States may discover increasing competition as a result of the activity of their foreign counterparts, some of which have requested information concerning the 1953 International Petroleum Exposition.

Wm. B. May, exposition general manager, divulged recently that requests have been received from organizations in Germany, France, England, and Belgium.

In the past years the United States government has approved admitting foreign exhibits duty free, and the attitude of the government this time may influence the desires of foreign manufacturers to exhibit. Approximately a thousand American manufacturers of oil field equipment will be represented at the 1953 International Petroleum Exposition, which is called the "World's Fair of the Oil Industry."

Over the years there has been a constant increase in the attendance of representatives from foreign countries, the peak being reached in 1948 when 43 nations had representatives in attendance.

Particular attention is again being given foreign attendance, and Governor Johnston Murray of Oklahoma and O. B. Irizarry, editor of *Petroleo Interamericano*, are currently engaged in a tour of Latin America for the purpose of presenting personal invitations to government officials and oil industry executives there. The specially prepared invitations are from Murray, as governor of Oklahoma, and W. G. Skelly, as president of the exposition. More than 50 nations are expected to be represented at the 1953 show.

The International Petroleum Exposition Housing Bureau office for the May 14-23, 1953 show in Tulsa was opened August 1 at 616 South Boston in Tulsa, according to Barton A. Myers, bureau committee chairman. Requests for hotel accommodations should be sent in as soon as needs can be ascertained, but it is emphasized that no action will be taken to confirm hotel reservations until Jan. 15, 1953. Hotels are making no direct assignment of rooms.

Settle Tanker Claims

Mexico and Italy have reached a settlement covering wartime claims in respect to tankers built for Mexico in Italian shipyards. Agreement provides that Italy recognize Mexico's ownership of the five ships still afloat of ten seized by Mexico April 8, 1941. Four are in Pemex service while the other belongs to the Navy Ministry. The Italian government will turn over to Pemex the tanker "Poza Rica," which was ordered by Mexico from the Ansaldo shipyards before the war. It will also pay Pemex $2,531,826 for the "Minatitlan" and the "Panuco" which were ordered by Mexico, but never delivered. They were sunk after the Italians took them over for wartime use.

To Build Pipe Mill

Construction of a 100,000,000-peso plant for manufacturing seamless line pipe for Petroleos Mexicanos is under way on an 85-hectare site within the city limits of Veracruz.

Officials of Tubos de Aceros de Mexico, or Tamsa, as the new company will be known, reported clearing and leveling of the land has already begun and that 80 percent of the necessary equipment has been delivered. Power will be supplied by a high-tension line from the electric plant at Tuxpango in the State of Veracruz.

Productive Wildcats In Germany

Successful wildcats are reported from Schleswig-Holstein and Hannover in Germany. In the Suderbruch oil field in Hannover a shale horizon proved to be productive with an initial yield of 60 tons daily through a 4-mm choke, from a depth of 7,650 feet. This find was made by an affiliate of Jersey and Shell. The geologists believe that it is an eruptive production out of a shale horizon which is looked upon as unique in Germany if not in the world.

Pipe Expanders and Aligners

Two new tools for use of the petroleum industry have been designed by the British firm of Donald Ross & Partners. They are the Twinner pipe expander which is used to press out the walls of a pipe to an accurate round form prior to cutting or welding, and the Twinner pipe aligner which holds the two ends of the pipe in exact alignment during the welding operation.

Governor Johnston Murray of Oklahoma (center) presents an invitation to attend the May 14-23, 1953 International Petroleum Exposition to Antonio Calvache, Cuban Director of Mines, Forestry and Water Resources. Another Cuban official, Nicolas Duarte de la Cruz, assistant treasurer of Havana province (right) accompanied Gov. Murray during his visit to Havana and was also invited to attend the gigantic oil show. Gov. Murray and O. B. Irizarry visited 13 Latin American countries during August presenting the special invitations personally to government officials and oil industry leaders there. Delegates from 43 nations attended the last show, held in 1948, and it is anticipated that as many as 50 nations will be represented at the 30th anniversary 1953 show.

Styrene Co-Polymers Extend Operations

Styrene Co-Polymers Ltd., a company organized four years ago by Petrochemicals, Ltd. and Lewis Berge & Sons, Ltd. to manufacture styrene co-polymers and alkyd resins from a styrene distillate fraction produced by Petrochemicals, Ltd. in its Catarole petroleum cracking process, has entered into arrangements for the manufacture of its products in Germany and Australia. They are used in the manufacture of paints, lacquers, printing inks, textiles and paper.

The original share holders in Styrene Co-Polymers, Ltd., Petrochemicals, Ltd. and Lewis Berger & Sons, Ltd., have been joined by Messrs. Pinchin, Johnson & Associates, Ltd. W. T. Branscombe, the managing director, and T. S. Dally, assistant managing director of Pinchin, Johnson & Associates, Ltd., have joined the board of Styrene Co-Polymers, Ltd. The company has placed an order for the installation of a 4,500-gallon reactor for the manufacture of styrenated alkyds, which incorporates unique new features. It will be the largest ever installed for the manufacture of such products and will be completed in about a year.

Century Geophysical Forms Canadian Subsidiary

Century Geophysical Corp., Tulsa, has formed Century Geophysical Corp. of Canada, a wholly-owned subsidiary, with Calgary headquarters and light crews in the field. James K. Ziegler was elected vice president in charge of the Canadian company. Mr. Ziegler has had seven years experience in Canadian geophysical operations.

Kuwait Production Rises

Production of crude oil during the month of June by Kuwait Oil Co., Ltd. is reported as 3,110,231 long tons or about 777,550 barrels daily. For the first six months of 1952 production totaled 18,255,018 tons, an average of 752,870 barrels daily.

Venezuelan Crude Production

Crude production in Venezuela averaged 1,826,483 barrels daily in the first six months of 1952. This compares with 1,704,643 b/d in 1951, an increase of 7.1 percent.

Following is a breakdown of average production by companies during the first half of the year and in individual months:

BARRELS DAILY

Company	January	February	March	April	May	June	Average 6 Months
Creole	814,073	820,796	810,709	817,961	830,225	813,115	817,805
Shell	571,659	564,339	573,342	574,593	569,999	560,585	569,155
M.G.O.	258,647	269,978	265,745	267,790	271,490	277,527	268,468
Socony	52,703	56,680	58,050	57,049	60,232	58,471	57,197
Mercedes	24,216	25,243	25,159	25,192	25,256	25,440	25,080
Texas	22,495	19,362	18,392	19,546	18,792	19,524	19,690
Richmond	15,833	19,820	16,279	19,419	19,992	20,911	18,681
Atlantic	17,936	17,459	17,146	17,403	17,741	18,558	17,707
Sinclair	14,063	14,108	13,539	12,210	12,385	11,915	13,036
Phillips	10,615	10,952	12,202	9,683	9,370	10,031	10,477
Pantepec	8,513	8,696	8,428	8,178	7,984	7,654	8,240
British	940	988	958	943	941	911	947
Guasare	...	...	...	...	...	...	...
Others	...	...	...	...	...	...	...
Totals	1,811,693	1,828,421	1,819,949	1,829,967	1,844,407	1,824,642	1,826,483

Oil Refinery Construction at Coryton

4,200-TON reinforced concrete caisson in position at Coryton after its ten mile down river journey from Tilbury. This structure forms part of the water intake jetty for the new oil refinery at Coryton under construction for Vacuum Oil Company Limited in conjunction with the Lummus Company Limited.

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Guests at the July meeting of the Houston chapter of Nomads were, left to right: Mukti P. Mukherji, Department of Explosives, government of India; A. J. Olsen, chief engineer, Continental Supply Co.; Harold F. Browne, chief engineer, accident prevention branch, U. S. Bureau of Mines; and Don L. Carrell, petroleum consultant, La Paz, Bolivia.

Oil Search in Switzerland

D'Arcy Exploration de Gaz et Petrole S.A., wholly owned subsidiary of the Anglo-Iranian Oil Co. formed in June 1952, has been engaged in geological and geophysical surveys since January 1952, in collaboration with a Swiss company, Societe d'Etude des Interets Miniers of Fribourg, in Fribourg and certain neighboring areas. The present work is of a preliminary nature and has not reached a point where prospects of the area can be evaluated.

Cycloversion Units Completed

Mexico's production of high-grade automobile gasoline has been stepped up by completion of the new desulfurizing unit in Mexico City's Azcapotzalco refinery. The unit is the second of its kind in Mexico. The first was installed in the Antonio M. Amor refinery at Salamanca. A third, now being built at the Ciudad Madero refinery, is expected to be in operation before the end of August.

Canadian Geologist Joins McCullough

R. E. Haskell has been appointed service engineer in charge of radiation well logging in Canada for McCullough Tool Co. He will operate out of McCullough divisional headquarters at Edmonton, Alberta. Mr. Haskell is a Canadian geologist who aided in the development of the new McCullough Scintillometer, the first gamma ray counter designed specifically for geological use. McCullough has exclusive rights to the use of the Scintillometer in bore holes in the earth for whatever purpose. Mr. Haskell's role in the early development of the Scintillometer was designing and building portable and flying scintillometer instruments for use in the search for uranium in Northern Canada.

R. E. Haskell

Electro-Magnetic Flaw Detection

Manchester Oil Refinery (Sales), Ltd. of England has developed an ink called "Supramor" for use in electro-magnetic flaw detection.

In recent years the introduction of mass production, together with the widespread application of welding processes, has resulted in the demand for new and simple methods of non-destructive flaw testing. One of these methods, usable when the test piece can be magnetized, requires only a simple electromagnet, a permanent magnet, or a direct current bearing coil of wire, and can be easily operated. When an ink containing a magnetic powder is applied to the specimen, a complete picture of all flaws becomes immediately visible. "Supramor" has been especially compounded for this purpose.

To Build Plant In Canada

Construction of a plant at Toronto, Canada, has been announced by Herbert J. Noble, president of Taylor Instrument Companies of Canada Ltd.

Site has been purchased and contracts let for the erection of a building with an area of 40,000 square feet. The space will be utilized both as an office and for manufacturing the companies' instruments.

Taylor entered the Canadian market in 1914 with a sales representative. In the early 20's it built its first manufacturing plant, and in 1930 was incorporated as a separate Canadian company. Since that date gross sales have increased eight-fold, an indication of the great potential of the Canadian market.

View Ethiopian Movies

Executives of Rogers Geophysical Co. and members of the company's exploration crew in Ethiopia, pictured above, gathered for a showing of movies of the crew's activities when they returned to Houston recently. Pictured, left to right, seated, are: Jesse R. Cornett, Russell Talty, Benny Walthall, John Monkhouse, Hank Gutormson, Glenn Fulbright, Ray Williams, Charles Hodde, and Oscar Lewis; standing, Sam Rogers, president of Rogers Geophysical, and James B. Nichols.

Plans Oil Port Improvements

The Navy Ministry of Mexico reports improvements now are being made in the port of Tuxpan which will enable tankers to take on cargoes directly at the wharves instead of on the high seas as at present. Two breakwaters are being constructed in that port which will not be completely finished until April, 1953, but by the end of October will be able to handle fairly large ocean-going vessels. Total cost of the port improvements, including dredging, will run to around 82,000,000 pesos. Similar improvements are planned at Tampico.

Dunkirk Lube Plant in Operation

The lubricating oil plant at Dunkirk refinery, operated by the Anglo-Iranian Oil Company's French associate, Societe Generale des Huiles de Petrole, B.P., is now in production.

The plant has a capacity of 55,000 tons per year and will supply the French and North African markets of SGHP, exporting the balance to other markets including Belgium, Holland and Switzerland.

Dr. Lal C. Verman, center, director of the Indian Standards Institution in Delhi, India, and honorary advisor on standardization to the Government of India, recently visited the research and development laboratory facilities at the Bayonne, N. J., refinery of the Tide Water Associated Oil Co. to study American methods of lubricating oil testing. With Dr. Verman are John T. McCoy, left, general supervisor of research and development for Tide Water Associated's eastern division, and C. Walter Frankenfield, supervisor of the automotive laboratory.

Iraq's Growing Output

Figures released by Iraq Petroleum Co., Ltd. show that its crude production for the month of June amounted to 1,876,130 long tons, an average of 469,033 barrels daily. For the first six months of this year the output was 8,513,731 tons, or about 350,840 barrels per day. Since the beginning of the year production has more than doubled and the increase for the January-June period shows an increase of over two million tons, or more than 82,000 barrels daily over the second half of 1951.

Of the June production 1,447,646 tons came from the Kirkuk field, 170,797 tons from Zubair and 257,687 from Qatar.

Mexican Production

Mexico's 1952 oil production will exceed 80,000,000 barrels, it was predicted in Mexico City by Jose Lopez Portillo of Petroleos Mexicanos' information department. Mr. Portillo attributed the planned production increase largely to the expansion of Mexico's drilling program. This year's schedule calls for 400 wells.

Opens New Canadian Branch

Opening of a new service branch at Grande Prairie, Alberta, was announced recently by the Canadian division headquarters of the McCullough Tool Co., Edmonton, Alberta. Grande Prairie will service the active Fort St. John, B. C., the Peace River Block, Tangent, and Valleyview territories.

John H. Williams, who heads the new branch, has worked for 19 years in Canadian oil fields and three years in Trinidad, B.W.I. He joined McCullough as a field service engineer in 1951 at Edmonton.

J. H. Williams

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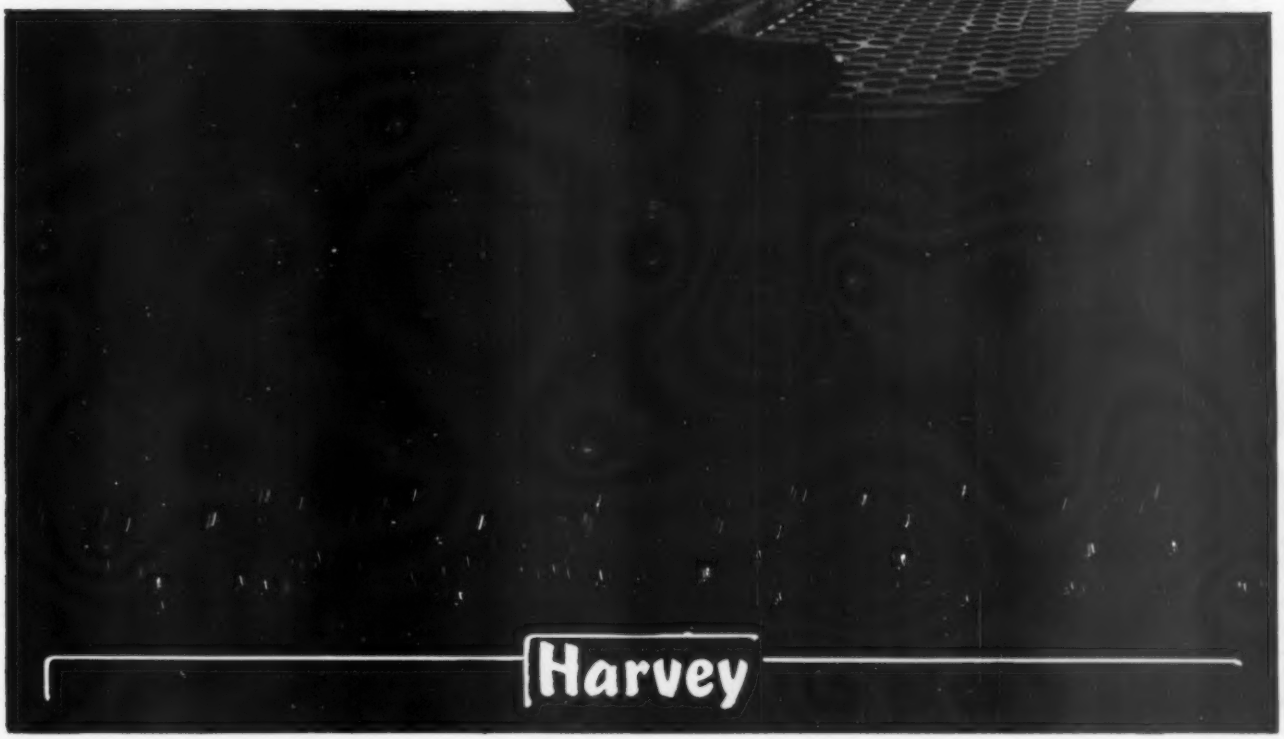


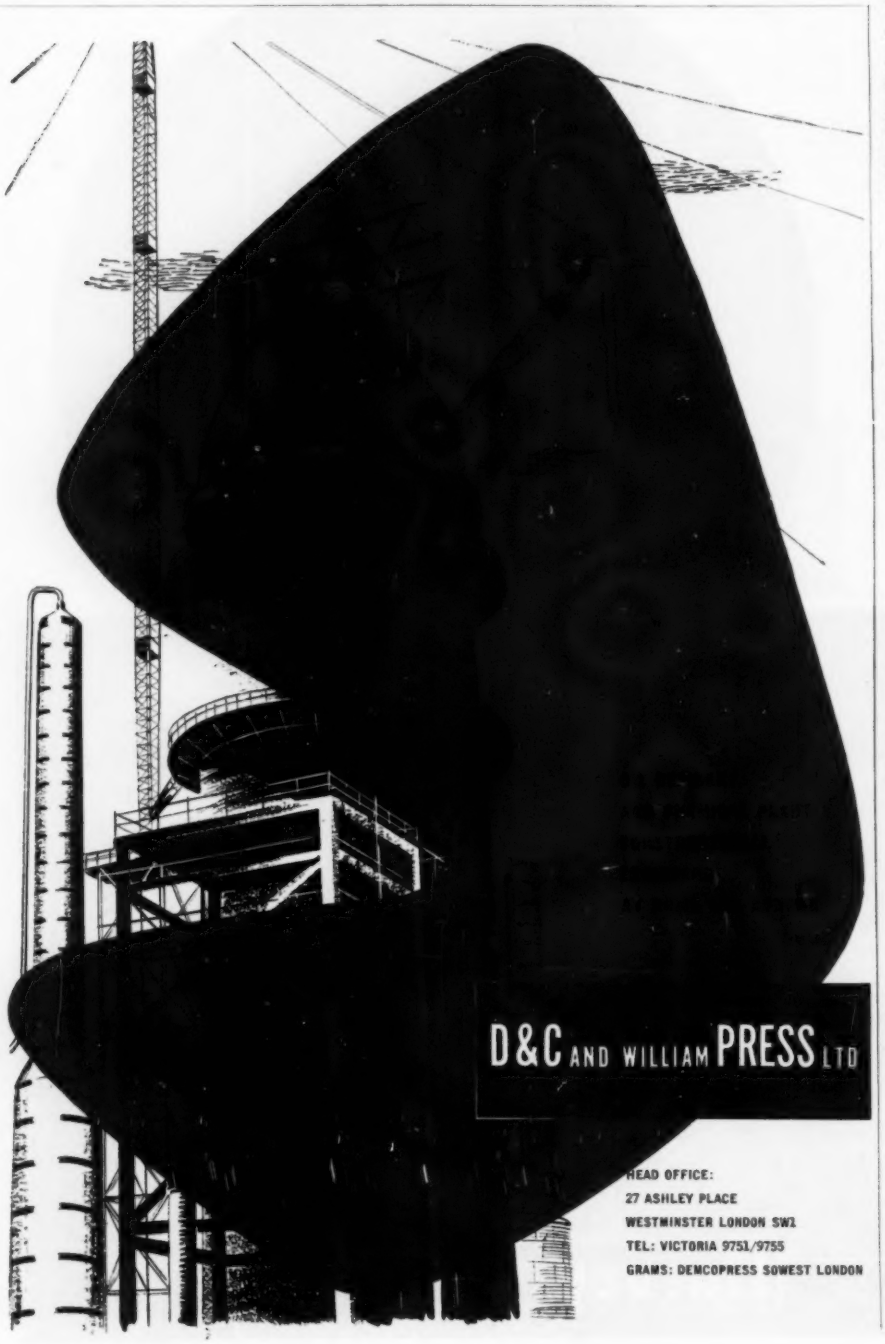
Argentine Capital to Develop Oil Concessions in Peru

A new oil company, Compania Sudamericana de Petroleo, has been organized in Lima by Argentine interests in cooperation with one of the principal Peruvian banks to develop oil concessions in Peru under the recently adopted law. President of the board is Fernando Madril of Buenos Aires and the managing director is the Argentine financier, Dr. Juan Jose Naon. During their visit to Lima they were accompanied by Ing. Tomas Ezcurra, former Argentine director of mines and member of the board of the YPF. This is believed to be the first time Argentine capitalists have undertaken oil development in a foreign country to supply the needs of the Argentine market.

Repair Pemex Tankers in California Shipyard

Eleven of Petroleos Mexicanos' tankers are being repaired in San Pedro, Calif., shipyards, it was announced in Mexico City by Alfonso Fragoso, head of the government oil agency's insurance department. The government oil agency is making every effort to speed up repair of its tankers in order to relieve the present fuel shortage of the Mexican railway system.

Petroleos Mexicanos will in the future repair its ships in its own shops at Tampico instead of sending them to the United States for this purpose, it was decided at a conference of top Mexican oil officials at Pemex headquarters in Mexico City. A shop will be built for that purpose.



Posts Crude Prices in Venezuela

Creole Petroleum Corp. has posted prices at which it will sell cargo lots of crude at Venezuela ports and prices at which it will buy crude from other producers in that country. Field prices are the same as fob cargo prices with adjustments for the cost of pipe line and terminal handling. A two-cent differential per degree of gravity was established for crude varying from the base in each field.

Following is the price posting established by Creole as of July 24:

Crude	Gravity °API	Price $/bbl.	F.O.B.
Bachaquero	14.0/14.9	1.61	Las Piedras or Amuay Bay
Tia Juana Heavy	16.0/16.9	1.65	"
Lagunillas Heavy	Flat	2.00	"
La Rosa	20.0/20.9	2.00	"
Tia Juana Medium	26.0/26.9	2.20	"
Tia Juana 102 L.P.	26.0/26.9	2.44	"
Tia Juana Light	30.0/30.9	2.28	"
Mara	30.0/30.9	2.33	"
Cumarebo	48.0/48.9	2.95	Tucupido
San Joaquin	42.0/42.9	2.81	Puerto La Cruz
Oficina	32.0/32.9	2.57	Puerto La Cruz
Jusepin	32.0/32.9	2.57	Puerto La Cruz
Quiriquire	18.0/18.9	2.24	Caripito
Temblador	20.0/20.9	2.28	Caripito
Pedernales	20.0/20.9	1.40	Capure (field)

Court Sidesteps Iran Issue

By a vote of nine to five, the judges of the International Court of Justice at The Hague have declined to hear the complaint of the British government against the government of Iran for its seizure of British owned oil properties. The ruling, announced July 22, was made without regard to the events of the case, but simply expressed a majority opinion that it was not within the competence of the Court although it had been named as the arbiter of disputes between Iran and the Anglo-Iranian Oil Company in the covenant agreed upon in 1933.

Refinery Report Submitted

The report of the Burmah Oil Company Technical Commission, which recently visited Karachi in order to examine the practicability of building an oil refinery there, has been presented to Sirdar Abdur Rab Nishtar, minister of Pakistan.

Following a visit by its managing director, W. E. V. Abraham, to Karachi last March, Burmah Oil Co. offered to erect a refinery in West Pakistan. The offer was quickly followed by a technical mission which studied the project from a practical point of view. It is the report of this technical mission which has now been presented to the Government of Pakistan.

Platforming Units for Anglo-Iranian

Announcement has been made that the Anglo-Iranian Oil Co. will install five platforming units in its various refineries. Four of these will have a capacity of 6,000 barrels per stream day each and one will be designed for 12,000 barrels daily.

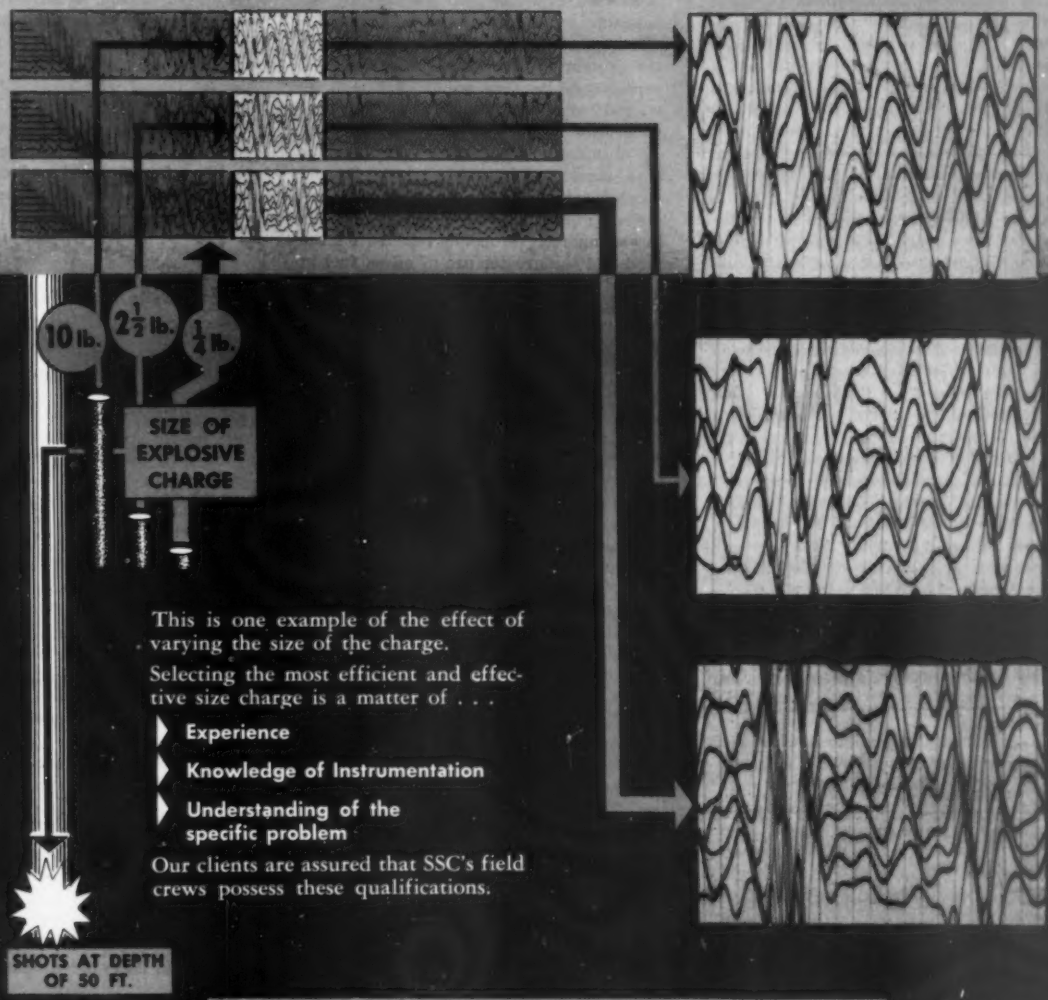
Two will be built in the United Kingdom, one in France, one in the new refinery at Aden and the other in the new Kiwana refinery in Australia. Engineering and design work has already been started on these units by the Universal Oil Products Co.

Hammond Licenses Vulcan In Canada

Hammond Iron Works has arranged with Vulcan Iron & Engineering Co. of Winnipeg, Manitoba to make available in Canada all Hammond designs of conservation storage tanks as well as standard API oil storage tanks. With plant and head offices at Winnipeg, Vulcan will fabricate and erect tanks of Hammond design throughout Canada. Vulcan maintains branch offices in Toronto, Port Arthur and Edmonton.

Basic Methods of Improving Seismic Records...

The Effect ...of SIZE of CHARGE



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Mineral Oil in Turkey

(Continued from page 94)

clusive state control favored by the then regime in Turkey, nothing came of those negotiations. "The Turkish Government has no intention," the then Minister for Economic Affairs declared before Parliment, "to allow Turkish oil to fall under foreign control."

Then in December 1948, Averell Harriman, President Truman's ambassador-at-large, was at Ankara to conduct conversations regarding political and economic matters, and the Turkish oil problem was among the topics discussed. The United States underlined its readiness to assist Turkey in her efforts to develop her oil areas. The United States agreed to purchase the whole of Turkey's output of chrome ore, and dollars from the proceeds of these sales would be available for orders for oil equipment, piping, refinery plant, etc. Turkey is one of the world's three or four leading countries as far as chrome ore is concerned. As a matter of fact, almost the whole of her output is sent to the United States which, as the world's most important steel producer, absorbs the bulk of the world's output of chrome.

An oil scheme submitted to the Ankara Government by American interests dated back to 1945. It envisaged the concession of a number of 99-year oil prospecting licenses in Anatolia. Part of the crude produced would be placed at the disposal of the Government at Ankara as royalty, and a pipe line would have to be built with its maritime terminus located in the port of Mersin, on the south Anatolian coast to the southwest of Adana. The scheme, however, found no favor. The Institute had its own plans which excluded the export of crude to be refined abroad and the consequent re-importation of the finished products. On the contrary, the Institute envisaged the erection of two refineries in Turkey partly to refine imported crude, to cost between eight and nine million Turkish Lira.

In April 1949, conversations were held with one of Socony Vacuum Oil Company's leading managers when he was on a short visit in Ankara. The formation of a mixed concern was discussed in which the Turkish State was to have a share together with shares to be held by American, British and other foreign oil interests. The object of the company was to have been the exploitation of the Ramandagh reserves and possibly of the other oil reserves subsequently to be discovered in Turkey. The scheme was not acceptable to the Turkish Government. French and West German proposals to develop the Turkish oil economy also proved failures.

New proposals were submitted by American financial circles toward the end of 1950 concerning the creation of a Turkish oil trust comprising various foreign interests. The activities of this trust were to cover the exploitation of existing oil fields in Turkey as well as exploratory work with a view to discovering additional oil deposits.

At the close of 1951 it was reported that a semi-governmental company was in course of formation. The proposed company would have a share capital of TL 300 million. The proposed company would continue a search for oil and build a 5,000 b/d refinery. It was proposed to give the company a monopoly.

Previously it had been decided that the Institute and the Eti Bank would build a 3,500-barrel plant at Batman, adjacent to the present 150-barrel skimming plant. It remains to be seen which plan will be adopted eventually, government or semi-government.

Consumption of petroleum products has been expanding quite rapidly in Turkey since World War II because of the increase in mechanization of agriculture, the larger number of motor vehicles on the road and the greater use of oil as fuel in coastal shipping.

Between the end of 1945 and the end of 1949 the number of private cars rose from 3,406 to 8,007, that of trucks from 4,479 to 11,470, while that of motor buses nearly trebled from 988 to 2,622 and that of motorcycles soared from 736 to 2,281.

The rapid expansion of imports of mineral oil products which has taken place in recent years is indicated in the accompanying table.

Much of the oil imported into Turkey in 1948 and 1949 originated in Iran. This has been largely eliminated as a source of supply during the past year. Prior to the shut-down of refining operations at Haifa, a considerable part of Turkey's needs for refined oils came from Israel. This source also has dried up because of political difficulties. Saudi Arabia and Bahrein Island are now the sources of most of the imports into Turkey. In 1949 Saudi Arabia supplied 110,885 metric tons of oil products and Bahrein 73,352 tons. The United States sent 4,575 tons to Turkey in 1949.

Estimated domestic demand for major oil products in Turkey in 1950 was 4,040,000 barrels divided as follows: motor fuel 1,775,000 barrels, kerosine 1,040,000 barrels, distillate fuel oil 775,000 barrels, residual fuel oil 300,000 barrels and lubricating oils 150,000 barrels. An increase in 1951 of an additional 29 percent to about 5,100,000 barrels of major products was indicated.

With a domestic crude production of only about 120,000 barrels and an expanding demand of the proportions shown, it is clear that Turkish authorities have much to gain by seeking to develop a greater indigenous supply of petroleum.

Israel Looks To Oil Possibilities

(Continued from page 97)

possibilities, but they differ in character and degree. Structural and stratigraphic traps probably exist in the Upper Jordan Valley and the Emeq, but they will be hard to find. In the faulted anticlines and blocks of the Galilee highland and the Carmel uplift the chances are fair to good. Somewhere beneath the Dead Sea-Wadi Araba area must be large oil and gas accumulations; despite the difficulties of search in a rift valley, the province's possibilities are good. The Negev has numercus structures worth testing; the foothills belt and coastal plain are folded and further work should reveal structural highs underlain by thick sections, predominantly marine. Stratigraphic traps are indicated for the Negev, the foothills belt, and the coastal plain. The possibilities of these three provinces are good.

"Thus the oil possibilities of two of the eight geologic provinces are obscure, of two are fair to good and of four, comprising more than three-fourths of the country, are good."

Houdriflow Unit for Antwerp

Houdry Process Corporation and its foreign representative, World Commerce Corporation S.A., announce that Albatros S.A. Belge pour le Raffinage de Petrole will install a Houdriflow catalytic cracking unit at its Antwerp, Belgium, refinery. This moving-bed installation, employing a gas-lift for catalyst circulation, is designed for a nominal capacity of 3,600 barrels per day. It will be the 85th Houdry licensed catalytic unit.

The agreements just concluded for the expansion and modernization of the Antwerp refinery also call for a feed preparation unit, a gas recovery and stabilization unit, a plant for the polymerization of light olefins produced in Houdriflow cracking operations, and new facilities for treating straight-run and catalytic gasolines.

Petrocarbon Ltd., Manchester, England, is a consultant to Albatros. The mechanical drafting, engineering and procurement are being handled by Head Wrightson Processes Ltd., of London, working in conjunction with Houdry Process Corporation.

Forms Service Department

American Cyanamid Co. has formed a sales service department for its industrial chemicals division, it was announced by A. J. Campbell, general manager of the division. The new department will provide trade records, sales analyses, and complete order processing for the division's main office in New York. R. C. Sarfaty is manager of the new department.

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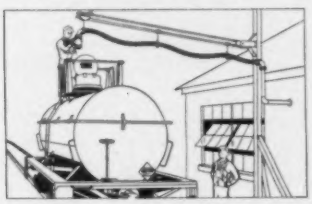
Easy Maintenance, Plus Added Safety, Marks Du Pont-Designed Metal-Flex Hose

With numerous installations already in use, the Du Pont-designed Metal-Flex unloading swing line has definitely proved its outstanding advantages.



Hardly any maintenance is required to keep the hose in working condition. This, added to the fact that only one man is required to connect and operate it, means that a Metal-Flex installation pays for itself in a very short time in lower labor and maintenance costs.

Refiners who have tested and used the Metal-Flex unloading swing line for a period of years report, moreover, that it is safer than any other type of unloading connection for TEL handling. Because it holds vacuum exceptionally well, it eliminates the minor leaks that so frequently result in unloading difficulties when rigid swing lines are used.

WEATHER RESISTANCE

Metal-Flex hoses have been installed all the way from Houston, Texas to Winnipeg, Canada. Throughout this wide range of weather and climate conditions they have been found to operate smoothly and easily at all times—in sleet and snow as well as in warm weather.

The Metal-Flex design was developed and built by Du Pont as a service to refiners who were expressly looking for a safer, more convenient connection that would overcome certain specific unloading problems.

Strategically Located Du Pont Rail Sidings Help Meet Emergency Needs for TEL Shipments

Whenever you have a "hurry-up" need for tetraethyl lead that has not been anticipated in your regular delivery schedules, there is a Du Pont TEL tank car loaded and waiting at a nearby rail siding ready for immediate delivery to your refinery. Primarily for emergency use, the Du Pont "rolling warehouse" facilities include seven rail sidings in addition to the plant storage area, as well as two tank truck terminals strategically located throughout the country.

THIS MAP SHOWS how the Du Pont TEL tank car sidings and tank truck terminals are conveniently located in, or adjacent to, major refining areas.

The TEL *tank car* facilities serve refiners from railroad sidings in Torrance and El Monte, California; Houston and Beaumont, Texas; East Chicago, Ill.; Kansas City, Mo.; Toledo, Ohio; and Carney's Point, N. J. The *tank truck* terminals, at El Monte, Calif., and Carney's Point, N. J., are complete with weigh tanks and storage facilities and make it possible for refiners to receive rush shipments of TEL in smaller-than-tank-car lots.

FOR EMERGENCY USE . . .

The main purpose of this nation-wide Du Pont TEL distribution set-up is to keep on hand an adequate supply of tetraethyl lead to supplement regularly scheduled deliveries that may have been held up by floods, train accidents, strikes or other unforeseen circumstances.

OVER

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

DU PONT

PETROLEUM CHEMICALS DIVISION
NEWS

DU PONT

CONTINUED

Rail Sidings

CONVENIENCE, TOO!

A second advantage of these siding and terminal facilities is the convenience they provide refiners who may need *additional* supplies of tetraethyl lead on a moment's notice . . . for rush orders or to meet unusually big commitments.

An ample supply of both Motor Mix and Aviation Mix is always maintained. And there is someone at the phone to expedite your order at any time of the day or night. Deliveries are fast, too. Most requirements can be filled in a matter of hours—depending on the distance to your refinery.

24-HOUR SERVICE

Here are two examples of how a Du Pont "warehouse-on-wheels" has operated to the customer's advantage.

Due to a recent strike, one refiner was called on to step up his production schedule for a short period. But he didn't have the necessary "lead" on hand for such an accelerated program. So he put in a call to the nearest Du Pont Petroleum Chemicals Division district office!

With a loaded TEL tank car on a nearby siding, Du Pont was able to deliver his order to the refinery within 24 hours.

In another instance, TEL cars *en route* to the West Coast were held up by floods. The delay could have meant a serious loss of production time for the West Coast refineries. But the Torrance and El Monte sidings were able to deliver enough TEL to keep the refineries producing on schedule until the regular shipments arrived.

FULLY-STOCKED WAREHOUSES

In addition to the above mobile units handling tetraethyl lead, Du Pont also maintains three fully-stocked warehouses in Houston, Los Angeles, and Wilmington, Del., which carry a supply of all other Du Pont gasoline additives.

Automotive Technologist

JAY BRENT MALIN

A specialist in internal combustion engines, J. Brent Malin joined the Du Pont Company in 1951 as an automotive technologist.

Much of Malin's work consists of assisting oil companies in solving product application problems—particularly those pertaining to large fleet operations. In cooperation with automobile manufacturers, he also works on engine developments pertaining to fuel and lubricant applications . . . and keeps up-to-date on significant automotive trends.

Malin came to Du Pont from North American Aviation where he applied his knowledge of combustion characteristics to the development of rocket motors. Prior to this, he spent 10 years in engine research and development work at The Texas Company.

What's in a Name?

Your company's name is one of its most important assets. It stands for your reputation for producing dependable products, as well as for the company's personnel and material assets.

And since your brand name represents your company in competition, it is important that your dealers and customers use the name whenever they refer to your gasoline brand . . . and know the quality features that distinguish it from other brands.

When you encourage motorists to use your brand names rather than such vague terms as "regular" or "premium," you are encouraging them to distinguish between *your* brands and all other gasolines.

To help stimulate dealers to promote your brand names more aggressively—and the quality features for which they stand—Du Pont has developed a unique brand name presentation. It is suitable for showing at dealer meetings and can be highly individualized to point up the distinctive selling features of your own gasolines. It is available to all oil companies.

MOVIES AVAILABLE

Prints of the following Du Pont films are available to oil companies for training and public relations purposes. They may be borrowed or purchased. Address request to nearest Petroleum Chemicals Division district office.

Pipeline on Wheels—A 26-minute, full-color movie on tank truck safety. Suitable for both training and public relations purposes.

What Makes a Gasoline Good—An 18-minute cartoon movie in color. Presents the story of how high quality gasoline is made in easy-to-understand form. Ideal for dealer training meetings.

In addition to the above, Du Pont makes available a special library of films of particular interest to the petroleum industry.

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A-3962

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The Wimpey Central Laboratory

has been responsible for site investigations for many oilfield development and refinery construction projects. This work has included exploratory borings and soil mechanics tests for foundations and harbour works, soil surveys for roads and pipelines, investigations of sources of constructional materials, development of special methods of building construction for hot climates, and corrosion problems with buried metals.

Site investigations in connection with the projects of major oil companies have been made at the Grangemouth, Coryton, and Ellesmere Port refineries, for oilfield development at Kuwait, Seria (Borneo) and Soengei Gerong (Sumatra), and for harbour and pipeline works in Aden, Syria, Iraq and Lebanon.

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OIL COMPANY STAFF CHANGES

EDWARD S. BALE, who has been manager of the Standard Oil Co. of Ohio refinery at Latonia, Kentucky, since 1949, has been appointed chief of the refining control division at Sohio's home office in Cleveland, Ohio. He joined Sohio in 1939 as process engineer at the Toledo refinery and later was general superintendent at the No. 1 refinery in Cleveland.

Forest G. Brown, who has been manager of both Sohio's No. 2 refinery and lithograph can factory in Cleveland since 1946, will become manager of the Sohio Latonia refinery, where he first started for Sohio in 1930 as a foreman on the night shift.

H. P. Ferguson, who has been chief of the refining control division since 1943, will become manager of both Sohio's No. 2 refinery and lithograph can factory in Cleveland. He joined Sohio in 1932 as an assistant to E. B. McConnell, Sohio vice president in charge of manufacturing.

Richard F. Hall, who has been administrative assistant in the industrial relations division of the manufacturing department, will become industrial relations assistant at the Latonia refinery. With Sohio since 1949, he succeeds J. E. Rover who was recently transferred to Sohio's offices in Cleveland.

DR. JOHN R. BATES has been appointed to the newly created position of technical adviser to the executive committee of Sun Oil Company's board of directors. His administrative and operating responsibilities in the chemical research and development department have been assigned to Dr. J. Bennett Hill, director of that department. Dr. Bates has resigned as a Sun director, but will continue to serve on the military fuels technical advisory committee to the Petroleum Administration for Defense.

C. S. MITCHELL, manager of crude oil supply and transportation for Cities Service Co. (Del.), has taken on the added job of supervising the engineering department during the absence of Harris Bateman, chief engineer, who will join the Petroleum Administration for Defense at Washington as head of the materials section.

Ben D. Leuty has been appointed assistant chief engineer. He formerly was chief civil engineer for Cities Service and recently has been special assistant to Mr. Mitchell.

W. C. STEVENSON has been elected vice president in charge of industrial relations for Union Oil Co. of California. He formerly was assistant to the executive vice president, industrial relations. Mr. Stevenson joined Union Oil in 1925 as a utilities inspector at Oleum Refinery. He became superintendent of distillation in 1939 and later transferred to the Los Angeles refinery where he was made manager. He returned to Oleum as manager in December, 1942.

K. E. TAPPY has been appointed superintendent of the Lima, Ohio, division of The Ohio Oil Company's pipe line department, succeeding the late P. E. Thompson. Mr. Tappy has served as assistant division superintendent at Lima since 1940.

J. M. SELDEN has been appointed manager of the eastern division of Shell Chemical Corp. He has been sales manager of the eastern division since 1946.

H. H. ANDERSON, vice president and general manager of Shell Pipe Line Corp. since 1941, has resigned to become vice president and general manager of the Trans Mountain Pipe Line Co. which is building a 711-mile, 24-inch pipe line from Edmonton, Alberta, to Vancouver, B. C. His headquarters will be at Vancouver where he will begin training a Canadian operating staff for the new line which is to be completed in 1953.

Mr. Anderson joined Shell in 1917 as an engineer in the Coalinga field in California. He became chief engineer of Shell's West Coast production department in 1925. In 1931 he was summoned to New York as assistant to the president of Shell Union, and the next year was made a vice president of Shell Oil Co.

Twice during the 1930's Mr. Anderson went to Washington in the cause of the oil industry. In early NRA days he spent a year as chairman of the Oil Code Authority's Labor Committee. In 1939 he went to Washington as one of eight executives selected to present the petroleum industry's story to the government's Temporary National Economic Committee.

J. D. WHEELER has been appointed division manager of The Ohio Oil Company's Houston production division. He succeeds R. C. Gwilliam, recently deceased.

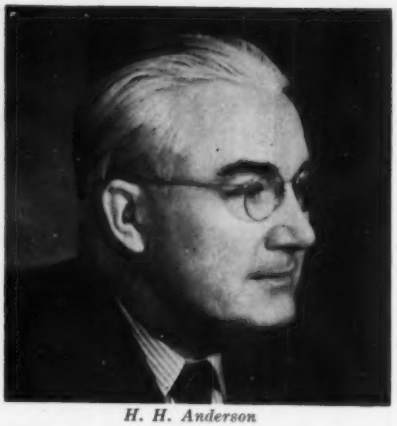
Mr. Wheeler joined The Ohio Oil Co. as District Petroleum Engineer in the East Texas field after experience with several other oil companies as a geologist both in the United States and in foreign fields. In 1941 he was appointed chief petroleum engineer and last February was appointed assistant division manager of the Houston division. He has been serving in that capacity since that time.

ROBERT L. KIEHN has been promoted to maintenance supervisor and Charles W. Harrison has been promoted to shift supervisor at Deep Rock Oil Corporation's Cushing, Okla., refinery. Mr. Kiehn has been in the engineering department at the refinery since starting with the company as a junior engineer. He was maintenance engineer before his latest promotion. Mr. Harrison was formerly pilot plant chemical engineer at the company's research and development plant.

J. ROSS MC MURRAY has been appointed general purchasing agent for Canadian Oil Companies, Ltd. to succeed George S. Middaugh, who retired after 41 years with the company. Mr. McMurray has been assistant purchasing agent since 1929, having been appointed to that position two years after joining the company.

JOHN A. MURPHY, chief reservoir engineer for Continental Oil Co., has moved his headquarters from Ponca City, Okla., to Houston. Mr. Murphy joined Continental four years ago and became chief reservoir engineer in 1950. W. W. Wilson has been appointed assistant chief reservoir engineer, and J. R. Spencer and W. A. Mead, supervising reservoir engineers. All three will continue to maintain headquarters at Ponca City.

L. G. PACKHAM has been appointed overseas general manager of C. C. Wakefield & Co., Ltd. In this capacity he succeeds W. F. List, who is now an assistant managing director. Mr. Packham was previously manager of the overseas division and has been with the company for 27 years.



H. H. Anderson

J. D. Wheeler

J. R. McMurray

L. G. Packham

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L. H. Nuland

L. H. NULAND has been appointed shareholders' representative in Australia and New Zealand by the Caltex Group. Mr. Nuland has had world-wide experience in the oil industry with more than 15 years in Pacific Ocean areas, including China and Japan. After serving in the First World War, he carried out a number of Pacific area petroleum assignments. He was appointed managing director of Caltex Oil (N. Z.) Ltd. in 1934 and Caltex (Africa) Ltd. in 1936.

During World War II he served on the staff of the Petroleum Administration for War and as liaison officer between that office and the State Department, in which capacity he visited South and Central America.

Since World War II, Mr. Nuland's service with Caltex has taken him into the Middle East, including Turkey and Egypt, to Greece and various European countries.

K. W. RUGH has been appointed manager of the public relations department of Phillips Petroleum Co., replacing Chester W. Cleveland who has resigned to re-establish his own public relations firm in Chicago. Fred Pralle becomes publicity director. Mr. Rugh has been with Phillips for more than 22 years, during the first 17 years having been engaged in the sales and distribution of liquefied petroleum gases, including management of Philgas Co., a Phillips subsidiary. He has served as assistant manager of the sales department during the past five years.

HAROLD BIBLE has been appointed to the newly created post of assistant manager of manufacturing of Lion Oil Co. He has been technical assistant to T. M. Martin since 1943. Ralph Latimer, who has been supervisor of the contract section of Lion's land department, replaces Mr. Bible as administrative assistant to the president.

R. H. Gardner

R. H. GARDNER, veteran of 33 years employment with Sinclair Oil Corp., has been promoted to the newly created position of research associate. Mr. Gardner joined Sinclair after his Army service in World War I. He served at the East Chicago and Coffeyville, Kansas refineries before his transfer. He later was promoted to the director of lubricants research division for Sinclair Research. He has been connected with this division for approximately 16 years.

E. R. BAKER has been promoted to manager of the development and research department of Continental Oil Co. succeeding L. L. Davis who has retired. Mr. Baker joined Continental at Ponca City in 1948 as manager of the central research laboratories and became assistant manager of the development and research department last year. During World War II, he served with the chemical warfare branch of the Army with the rank of colonel and helped to develop the Army's famous 4.2-inch chemical mortar.

DONALD F. SEARS has been named vice president of Shell Pipe Line Corp. He formerly was assistant to the president. Mr. Sears joined the company as an engineer in 1927. In 1931 he became assistant general superintendent in charge of the company's oil gathering facilities. In 1939 he was made a director, general superintendent and assistant secretary.

Mr. Sears spent three years in Washington during World War II with the Petroleum Administration for War. He was successively Chief of the Pipe Line section, Pipe Line Engineering and Materials section and the Pipe Line Operating section. He took part in the formulation of the enormous emergency construction program including the Big Inch and Little Big Inch pipe lines and other government and private emergency projects.

J. W. Brice

JOHN W. BRICE, who joined the Standard Oil Co. (N.J.) organization in 1926 as a geologist, has been elected president of The Carter Oil Co. He succeeds O. C. Schorp, who is retiring. During his service with the Jersey organization, Mr. Brice has been with Humble Oil and Refining Co. in Texas, Creole Petroleum Corp. in Venezuela, Standard Oil Co. (N.J.) in New York, and with Carter in Tulsa. He has been chairman of the board since the middle of last year. M. A. Wright has been made executive vice president and director.

Mr. Schorp began his career with the Jersey affiliates in 1920 in Mexico. During the past 32 years he also has worked in South America and New York. He has been associated with Carter since 1939 and has been the company's president since March, 1943. He will reside in Florida.

W. G. MILLER has been appointed project manager for Caltex (Philippines) Inc. to take charge of field construction and other phases of the company's refinery construction job at Batangas, P. I. The proposed new 16,000-barrel refinery will be managed by L. D. Josephson.

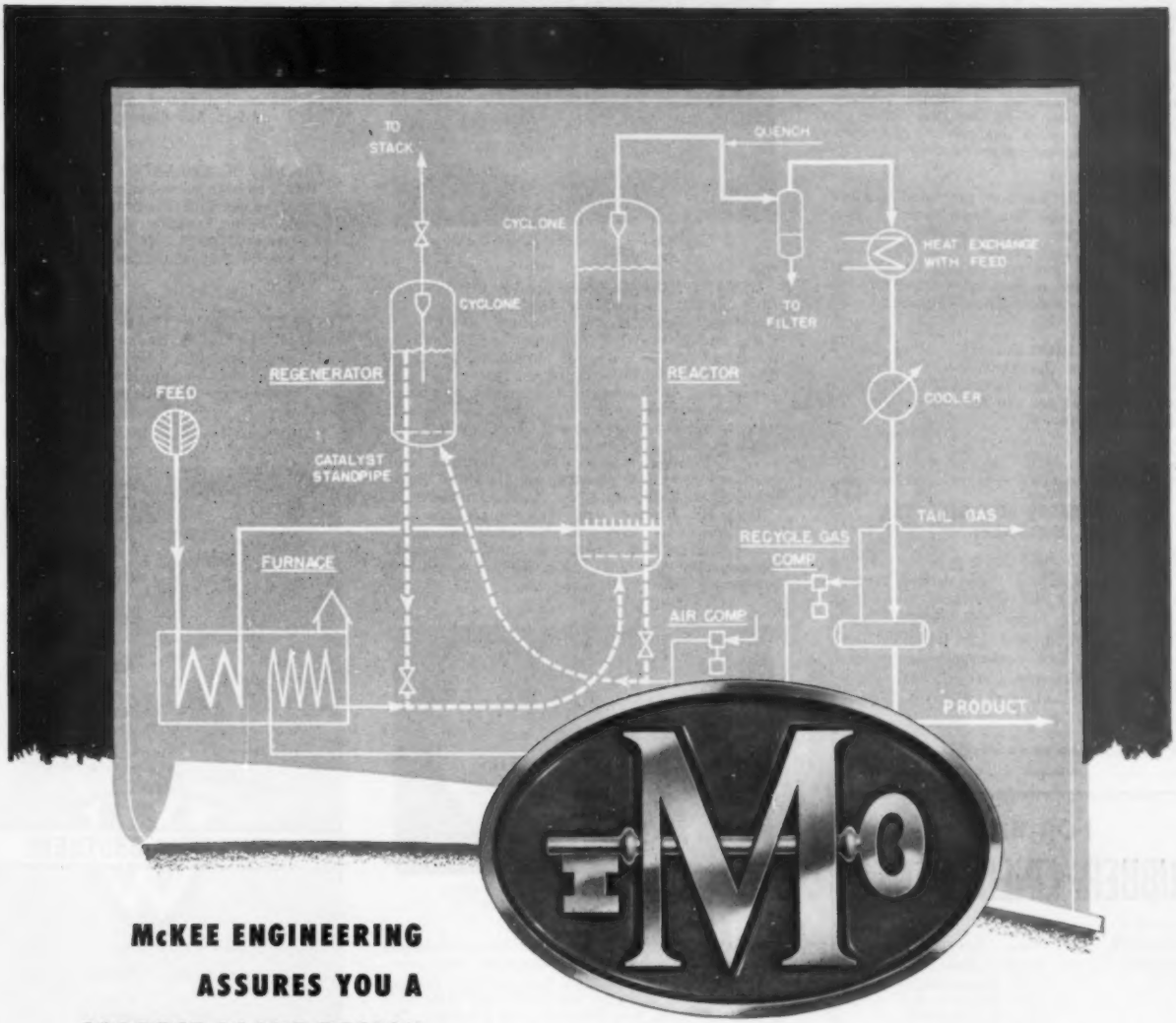
Mr. Miller helped supervise construction of the Caltex refinery on Bahrein Island in the Persian Gulf in 1935. After service as field supervisor of the general engineering department of Standard of California, he became supervisor of Arabian American Oil Co. in the construction of a pipe line and marine terminal at Ras Tanura. He transferred to Caltex in 1943 to supervise the construction of aviation gasoline facilities at Bahrein. Since then he has been engaged in similar work in Sumatra, Australia and New Jersey, U.S.A.

Mr. Josephson left Standard of California's refining department in 1939 to become an operating foreman at Bahrein. In 1945 he took charge of the catalytic unit, in 1947 became assistant superintendent and in 1949 was advanced to general superintendent.

H. H. Bible

D. F. Sears

W. G. Miller



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District Engineering Offices: Union, New Jersey and Tulsa, Oklahoma.

DR. H. A. AMBROSE has been appointed director of the product division of Gulf Research & Development Co. Dr. C. W. Montgomery has been named director of the process division with W. C. Offutt serving as assistant director.

The activities of the product division will be devoted principally to the development of new products and to improving all existing products. The process division is divided into three primary sections to work on refinery processes, new processes, and petrochemicals.

DEAN CHRISLIP has been promoted to superintendent of the pipe line department of Deep Rock Oil Corp. Mr. Chrislip joined Deep Rock in 1946 after service in the U. S. Navy. He became assistant general production superintendent in 1950 and a year later transferred to the pipe line department as field engineer.

PETER A. BLASCO has resigned as district representative for the Universal Oil Products Co. of Chicago to be assistant to L. Curran, general superintendent for the Aurora Gasoline Co. of Detroit, Michigan.

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R. P. Huggins

T. H. Wallace

R. PAUL HUGGINS, vice president of Western Gulf Oil Co. in charge of California operations, has been elected a vice president of Gulf Oil Corp. and of the Gulf Refining Co. He will be in charge of the crude oil purchasing activities of the two companies under the general supervision of J. H. Russell, vice president in charge of pipe lines and crude oil purchasing. He will take up residence at Houston, Texas, where the crude oil purchasing department is headquartered.

T. H. Wallace, assistant to Mr. Huggins, will succeed him as vice president in charge of Western Gulf Oil Co., with offices in Los Angeles.

Both Mr. Huggins and Mr. Wallace are veterans of many years with Gulf. Mr. Huggins joined Gulf in the Houston production accounting department in 1921. Mr. Wallace joined the company at Hull, Texas, in 1926.

V. M. Norwood

J. M. Allan

VINCENT M. NORWOOD has been appointed manager of Canadian Oil Companies Ltd. new refinery at Sarnia, Ont. He is a native of Sarnia and joined the company 16 years ago after his graduation from the University of Toronto. In the fall of 1941 he was promoted to chief engineer. In the summer of 1943, when E. A. Smith, general superintendent, was loaned to the government, Mr. Norwood became superintendent. Still another promotion came in December, 1950, when he was made general superintendent of the Petrolia refinery, which position he continued to hold until he was appointed to his present post.

John M. Allan has been appointed chief chemist at the Sarnia refinery. Prior to joining Canadian Oil in 1937 as research chemist, he was employed by Imperial Oil as control chemist. He is a naturalized Canadian citizen, having been born in the United States.

V. DESSOY has been appointed retail sales manager and P. L. Tremblay Montreal division manager of Shell Oil Co. of Canada.

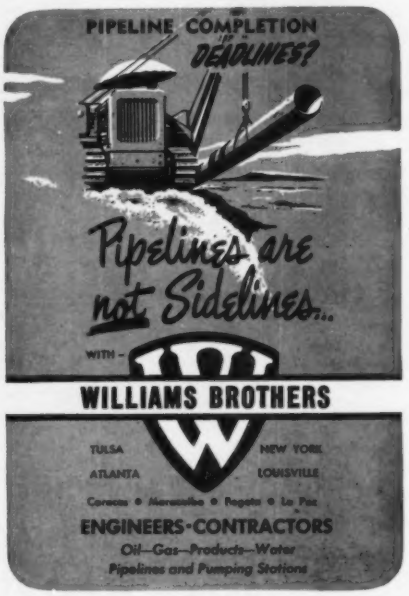
Mr. Dessoy, with headquarters at the head office in Toronto, will be responsible for the administration of Shell's retail marketing activities throughout Canada. Mr. Tremblay, in Montreal, will assume direction of the company's marketing operations in the Province of Quebec.

WAYNE C. MOODY, Sunray Oil Corp. production department engineer, has taken a six-months' leave of absence to join the production division of the Petroleum Administration for Defense, Washington, D. C. He will be in charge of Section B group for the allocation of oil country tubular goods to all operators drilling 41 or more wells annually.

BRUCE SCRAFFORD joined the Highland Oil Co. of Houston June 1 as vice president, according to Virgil A. Brill, president. Mr. Scrafford will also be assistant manager of the Herman and George R. Brown Oil and Gas Division and will serve as vice president of Esperado Mining Co. and Frio Pipe Line Co. Since 1943 Mr. Scrafford has been a consulting geologist in Corpus Christi and San Antonio.

ROBERT H. COLLACOTT, who joined Sohio in 1920, has been named an assistant to the chairman of the board of The Standard Oil Co. (Ohio). He has been manager of marketing research since August, 1949. In his new job he will have special responsibilities in the field of economics.

COLBY H. BEATTEAY has been appointed superintendent of marine terminals of Canadian Oil Companies, Ltd. He succeeds Leonard Y. Reed who has been promoted to manager of the lubricating oil and grease manufacturing plant.



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Here is a book that offers a comprehensive, yet eminently readable account of the forces and phenomena that shaped the earth. In it, the present is used as the key to the past. Instead of beginning in the dim unknown with strange terms and concepts, the reader is first introduced to the study of familiar rocks and soils . . . then volcanoes, earthquakes and glaciers. The book continues back through time—through the ice ages . . . the birth of mountains . . . the early trickles of today's mighty, grinding rivers—right through to the conjectured origins of the earth. A feature of the book is the set of paleogeographic maps of North America, with a tissue overlay map of present-day contours, showing how our continent changed during the different geologic ages.

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DIVISION MANAGER

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SAUDI ARABIA DIVISION OFFICE: DHAHRAN, SAUDI ARABIA

NUMBER FOUR IN A SERIES INTRODUCING GSI DIVISION MANAGERS AND DEPARTMENTS

A. J. Herron

A. J. HERRON has been appointed general manager of Australian Oil Refining Pty., which will erect a 22,000-barrel refinery at Kurnell, Australia. R. W. Parker has been appointed project manager in charge of all phases of design and construction of the new plant.

Mr. Herron has been with Caltex companies since 1944 when he transferred from The Texas Co. where he had been in the refining department for many years. His Caltex assignment was as assistant superintendent of the Bahrein Petroleum Co. refinery in the Persian Gulf.

Mr. Parker joined Standard Oil Co. of California in 1930 after service with Union Oil Co. and C. F. Braun. He transferred to Caltex in 1948 and was sent to Europe to supervise refinery construction. Recently he has been general manager of the affiliate Italian company, SARPOM.

JAMES J. COSGROVE, chairman of Continental Oil Co., retired August 1 from active management duties. He will continue to serve as a director and as chairman and will be available to the company in a consulting capacity.

Mr. Cosgrove has served 23 of his 30 years in the oil industry with Continental. After seven years on the legal staff of the Texas Co., he resigned to become general counsel for Continental in 1929.

ALLEN P. BOWIE has been granted leave of absence from the General Petroleum Corp. to serve as chief of petroleum reserves for the Petroleum Administration for Defense in Washington, D. C. Mr. Bowie was district petroleum engineer in the company's exploration division offices at Ventura, California. Innes M. MacKenzie, Jr. has been transferred from the Los Angeles office to succeed Mr. Bowie.

S. P. KENT, formerly acting assistant manager of the Texas Petroleum Co., Bogota, Colombia, has been transferred to Edmonton, Canada, where he is to be drilling and production superintendent of Texaco Exploration Co. Mr. Kent has been with the Texas Company or its subsidiaries since 1934. He had been working in South America from 1946 until he was transferred to Canada on May 1.

DR. C. M. BLAIR has been named superintendent of the new chemicals and plastic resins plant to be constructed at Seadrift, Texas by Carbide and Carbon Chemicals Co. The plant will produce ethylene oxide as a principal product.

Dr. Blair has been assistant superintendent in charge of chemical manufacturing and the technical development laboratory at Texas City.

F. C. W. Paton

F. C. W. PATON has been appointed general manager of foreign marketing for Gulf Oil Corp. He formerly was assistant to the late W. A. Berryman, vice president in charge of foreign marketing. In his present assignment he will be responsible for directing the company's marketing activities through some 30 subsidiaries operating outside the continental United States.

Mr. Paton resigned as assistant manager of another company's marketing subsidiary in Belgium in 1939 to join Gulf. He was Gulf's director of foreign supplies in 1950 when he was made assistant to the vice president.

HERMAN C. COWDERY of Bartlesville, Okla., has been named assistant purchasing agent for Cities Service Co. (Del.) He has been a buyer in the department since 1947. Previously he was a member of the engineering department.

A Shell photograph.

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A. R. Meyer

Meyer Heads National Supply Exports

Consolidation in Pittsburgh of the executive offices of The National Supply Co., including several departments formerly in Toledo, has been accompanied by a number of changes in the company's sales organization.

Thomas J. Walne, formerly head of the export division, has been appointed general manager of oil field sales. His staff will consist of R. W. Gordon, sales manager, merchandising products; M. E. Swaim, sales manager, production equipment; E. T. Cushing, sales manager, drilling equipment; and H. E. Heywood, manager, general sales office.

A. R. Meyer has been appointed manager of the company's export division in New York City. Sales activities will be handled by E. M. Gretzler, sales manager.

FTC Cartel Report Released

Acting on the request of Senator Sparkman, chairman of the Senate's Small Business Committee and Democratic candidate for Vice President, President Truman on August 18 ordered publication of the Federal Trade Commission's report alleging the existence of an international cartel monopolizing world oil trade. This is the report that has been classified as top secret on the ground that it might impair the relations of the United States with friendly nations if made public.

The report is divided into ten chapters dealing with the organization and operations of leading international oil companies with marketing conditions in various countries. Senator Sparkman stated that his committee would hold hearings on the report if requested by the oil companies. This action is independent of the grand jury investigation ordered by the Department of Justice.

Southern Enlarges Staff

R. E. Gathings has resigned as vice-president and supervisor of Southwestern Consultants, Inc., and has joined Southern Geophysical Co. as a supervisor stationed in California. K. C. Van Orden, who has been in geophysical work for ten years operating in Texas, Oklahoma, Kansas, Colorado, and Canada, has joined the Southern staff in the San Juan Basin in Colorado. He reports to the Rocky Mountain division office in Denver under the direction of Elmer F. Blake, vice-president.

HARLEY M. ROSS, superintendent of Carbide and Carbon Chemicals Company's Texas City petrochemicals plant, has been appointed assistant works manager for the company at New York. He will be succeeded by E. J. Fox, who moves up from his present position of assistant superintendent.

B. A. Weil

Joins Baroid Sales

Ben A. Weil has joined the advertising department of the Baroid Sales Division, National Lead Co., Houston, Texas. Prior to joining Baroid, he headed his own advertising agency in Corpus Christi, Texas.

Secondary Recovery Report

The Interstate Oil Compact Commission announces the publication of a pamphlet entitled "Summary, Secondary Recovery Operations in Kentucky to 1951, Including Annual Kentucky Oil Production by Counties." This publication is the result of a joint survey by the State of Kentucky and the Interstate Oil Compact Commission. Data on 17 secondary recovery projects is given. Copies of the pamphlet may be obtained from the Interstate Oil Compact Commission, P. O. Box 3127, State Capitol, Oklahoma City 5, Okla.

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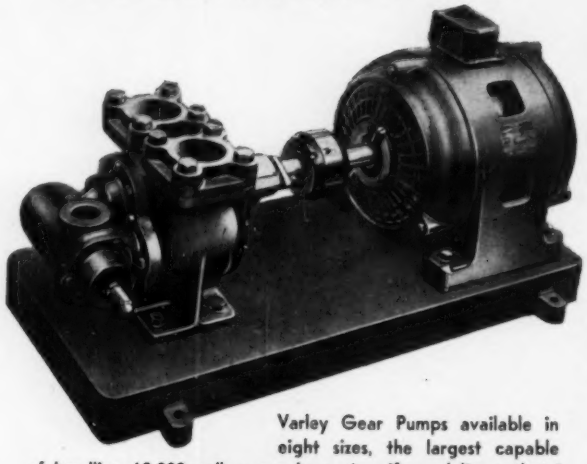

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Vol. IV—Condensate Production and Cycling, 1948 ..... $ 5.50
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George Armistead, Jr. $10.00

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Crude Oils—Benjamin T. Brooks and A. E. Dunston $11.00

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M. L. Van Wagner

S. B. Jones

R. L. Walker

McCullough Tool Promotions

Promotion of four key personnel was recently announced by McCullough Tool Co. L. Van Wagner was appointed assistant eastern division manager with headquarters at Houston, Robin Knight was promoted to senior salesman at Oklahoma City, R. L. Walker was promoted to branch manager at Snyder, Texas, and Sam B. Jones to branch manager at Hadacol Corner, Texas.

The promotions are a result of recent expansion of the McCullough Tool Co., which recently announced the opening of four new branches at Hadacol Corner, Sherman, Luling, and Beaumont, Texas.

Magcobar Promotes Daigle

John R. Daigle has been appointed assistant general sales manager of Magnet Cove Barium Corp. His office will be in the Oil & Gas Building in Houston. He was formerly district supervisor of the Corpus Christi district. He is succeeded by M. L. McGannon, previously a service engineer in McAllen. Ralph Weber has been appointed district supervisor of the Victoria district. Previous to his appointment he was a service engineer in Corpus Christi.

Book Review

American Pipe Lines, Their Industrial Structure, Economic Status and Legal Implications, by George S. Wolbert, Jr.; published 1952 by University of Oklahoma Press, Norman, Okla.; 179 pages, $3.50.

In recent years there has been much anti-trust activity designed to remove the alleged taint of monopoly from big oil business. One of the most fought-over propositions is that major integrated oil companies should be divorced from ownership of pipe lines. Government agencies, legislatures and courts have intervened in attempts to harmonize conflicting interests in this field, and have produced a crazy-quilt of regulatory laws which obscure the facts essential to an intelligent appraisal of the situation.

The author here presents an analysis of the salient factors involved in the economic and juridical status of pipe lines. He defines the issues and surveys the legal and administrative remedies designed to cope with pipe line problems. He has produced a book of value for economists, lawyers, members of the pipe line industry and all others having an intelligent interest in this essential branch of the petroleum industry.

Regina Refinery Expansion

Contract for the major portion of a $7 million modernization program at Imperial Oil's Regina refinery has been let to the Fluor Corp. Plant construction is expected to begin late this year and be completed by the spring of 1954. Clearing and preparation of the site was started.

The contract includes the building of a 7,500-barrel fluid catalytic cracking unit, a vacuum distillation unit with a 9,000 barrel daily capacity, and a light ends plant for the recovery of gases. The expansion program, to be carried out on the refinery's present 255 acre site, will raise the refinery capacity from 20,000 to 25,000 barrels a day.

Pemex Lays Products Lines

Five Mexican cities will be linked by oil products pipe lines now being constructed between the Salamanca refinery and Irapuato, Leon, Lagos de Moreno and Guadalajara, it was announced by Petroleos Mexicanos in Mexico City.

The project, which is expected to be completed before the end of this year, is designed both to reduce shipment costs of oil products and to speed up their delivery to Mexican industrial centers.

Another effect will be the "freeing" of transport units now used to move oil from Salamanca to these cities for assignment to other zones with faulty distribution systems.

Book Review

Tool Steel Handbook; published 1951 by Allegheny Ludlum Steel Corp., Pittsburgh, Pa., 197 pages; free on request.

This handbook is designed for engineers, teachers, metallurgists, and others interested in steels for tools, dies, and similar purposes. The descriptive matter covers the five tool steel groups: high speed, hot work, shock resisting, cold work, carbon and low alloy steels. The text is so arranged that the types of steel required for a very large number of tool steel applications can easily be found, along with extensive discussions of heat treating and handling techniques, and much useful reference material.

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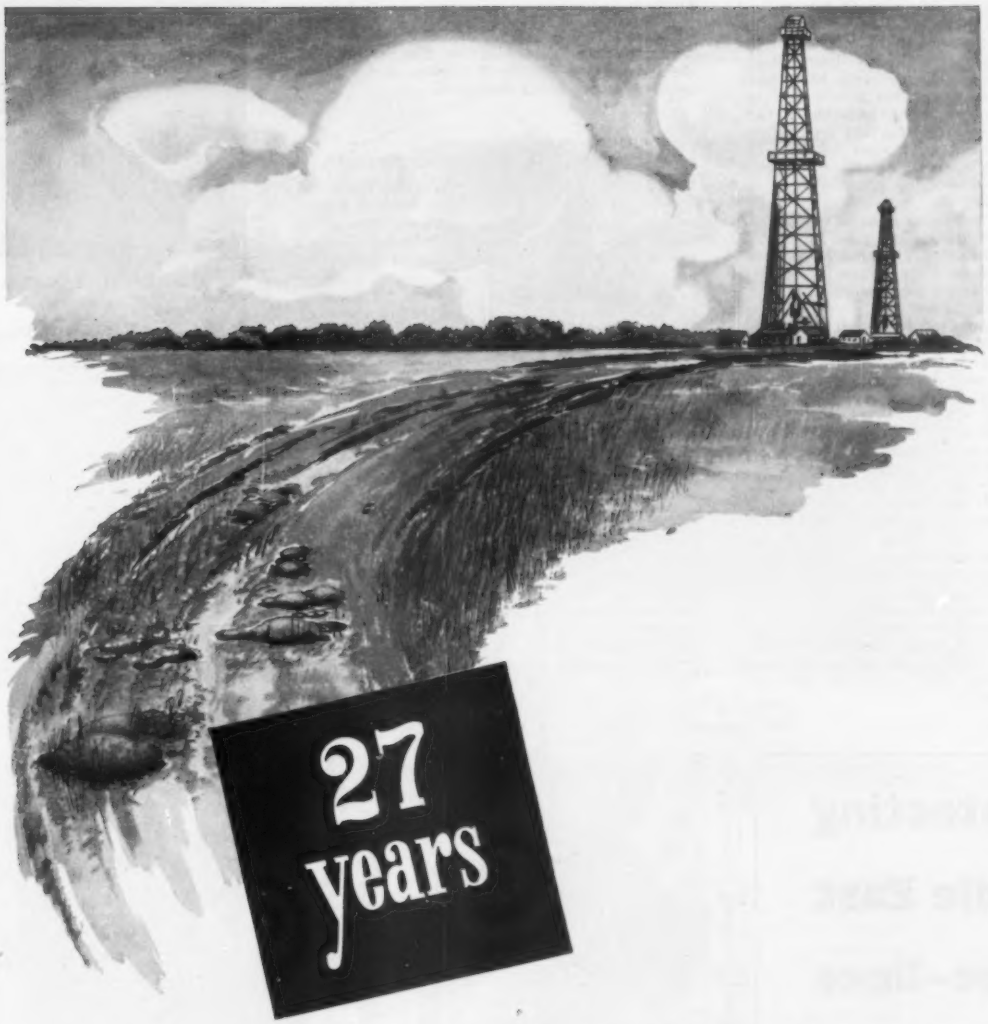

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World Oil Consumption

(Continued from page 57)

in the Middle East where this year's consumption will be lower by about 16,000 b/d than in 1951. It is calculated that consumption in Iran in 1952 will drop about 10.4 million barrels or 28,000 b/d. A considerable part of this reduction is due to the elimination of bunkering at Abadan since the refinery there was seized by the Persian government and shut down. Business conditions generally in Persia have been disrupted by the action of the government so that normal consumption has been badly curtailed. While Iranian consumption has fallen, there have been substantial rises in Bahrein, Saudi Arabia, Syria, and Lebanon ports to which much of the bunkering formerly done at Abadan has been shifted.

Most rapid rise in consumption of petroleum products in the world is taking place in Southeast Asia and in Oceania. The area as a whole is expected to consume 270.8 million barrels of oil this year. This is an increase of 39 million barrels or 25.6 percent over 1951.

From the standpoint of total volume, Japan is the leading gallonage gainer in the area. The island empire is expected to consume 32.2 million barrels of oil this year compared with 25.1 million barrels in 1951, an increase of 26 percent. Australia is second with an increase of 5.5 million barrels over 1951 to 50.6 million. Pakistan is expected to have an extraordinary 38 percent gain in oil demand to 13.8 million barrels.

In the European zone, the United Kingdom is showing the most important expansion in oil consumption this year. It is estimated that total demand will reach 174.8 million barrels, an increase of 17.5 percent over the 148.6 million barrels consumed in 1951. France, Belgium, Western Germany and Sweden all are enjoying increases in oil business well above the general level.

African consumption is growing at about the same rate as that of Europe. Total for the continent this year is estimated at 133.7 milion barrels as compared with 120.5 million in 1951, an increase of 10.6 percent.

In Latin America, Brazil continues to boom. The rapid expansion of industry and trade in that republic is expected to expand oil sales 17.2 percent this year to 47.2 million barrels. Venezuela and Chile also are increasing their consumption at a more rapid rate than the region as a whole. Venezuela is expected to use 12.4 percent more oil this year and Chile 12.5 percent more.

As a whole, the world oil trade in 1952 promises to be satisfactory in volume. Supplies of most products appear to be adequate. The flexibility of the industry in meeting disruptive events again has been impressively displayed.

American Maracaibo Expansion

Stockholders of American Maracaibo Co. voted recently at the annual meeting in favor of a plan to acquire all of the stock of Case-Pomeroy Oil Corp., Felmont Oil Corp. and Montoya Oil Co., Inc., the operating oil subsidiaries of Case-Pomeroy & Co. Under the proposal, American Maracaibo will issue 1,103,526 shares of its common stock to Case, Pomeroy & Co., Inc., in exchange for the stock of the Case-Pomeroy subsidiaries. Directors elected were: Hadley Case, president of Case-Pomeroy, as president of American Maracaibo Co. to replace Frederick R. Ryan, and Harry A. Richards, vice president of Case-Pomeroy, as a director.

New Service Lab

Tennessee Eastman Co. recently opened a new sales service laboratory building at Kingsport, Tenn. The gasoline laboratory is organized to analyze all types of gasoline and to recommend sweetening and/or inhibiting procedures. Among the tests which this group is prepared to make are induction period, existing gum content, copper dish gum content, ASTM distillation range, mercaptan content, peroxide number, lamp sulfur, lead content, color, gravity, potential gum, Reid vapor pressure and copper content.

W. A. Schlueter

To Survey Scientific Progress Abroad

W. A. Schlueter, president of Refinery Supply Co. of Tulsa, and Dr. H. M. Sullivan, research director of Central Scientific Co. of Chicago, are on a two month trip to Europe where they will confer with leaders in the production of scientific instruments and laboratory apparatus in Britain and on the Continent. The purpose of their trip is to survey the latest progress in technological methods and instrumentation with a view to making such information available to American manufacturers.

Lane-Wells Adds New Offices

The Lane-Wells Canadian Co. has established a new office in Swift Current, Saskatchewan, to serve Lloydminster on the northwestern Saskatchewan-Alberta border and the Coleville area in the southwest.

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Today's conditions, however, call for departures from "routine." Otherwise, endless complexities, shortages, etc., could require three times the normal effort to get a plant built. But Lummus has the quality and versatility of staff—the breadth and depth of operations, to meet these conditions head-on and help you maintain near-normal status.

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A. E. Dorn

Allis-Chalmers Sales Manager

A. E. Dorn has been named industrial sales manager, tractor division, Allis-Chalmers Manufacturing Co., according to an announcement by W. G. Scholl, vice president and general sales manager. He has been Pacific Coast territory manager for the firm since 1943, supervising sales including industrial products in the Western states, British Columbia, and Alaska. L. W. Davis, branch manager at Oakland, Calif., succeeds Mr. Dorn as Pacific Coast territory manager.

F. J. Buckner Corporation

The F. J. Buckner Corp. has taken over the business of Refinery Maintenance Co., Inc. of Compton, Calif. F. J. Buckner, an engineer with 25 years of experience in oil, is president of the new company which will specialize in the design and construction of processing plants.

Ethyl To Produce Insecticide

Plans for the large-scale production of lindane, an insecticide, are announced by Ethyl Corp. A new plant being built by Ethyl is scheduled for completion early next year. In a companion move, Ethyl announced that greatly enlarged facilities are nearing completion for the production of the benzene hexachloride or BHC from which lindane is derived. Lindane is reported to be effective against a wide range of insect pests, and can safely be used, under prescribed conditions, on live-stock and food crops as well as on fiber and forage crops.

Heads Foster Wheeler Purchases

A. J. Lacock has been appointed director of purchases of Foster Wheeler Corp. and will be responsible for the operations of the general purchasing department, according to an announcement by Earl W. Hills, president. Mr. Lacock replaces F. J. Swenson, who has been with Foster Wheeler since 1921 and will remain active as special assistant on purchasing problems. Mr. Lacock, who is an industrial engineer, was with General Electric for 17 years. Since 1947, he was district manager of sales for the New York territory for Lukens Steel.

F. J. Swenson *A. J. Lacock*

A. A. Ashton

Ashton Made Chief Engineer of Emsco

A. A. Ashton, designer of Emsco Derrick & Equipment Company's first G Series drilling rig, has been made chief engineer of the company. He joined Emsco in Los Angeles in 1936, and in 1940 was transferred to Houston as assistant chief engineer.

Drilling and Production Practice 1951

The Dallas Division of Production Office announces availability of the 1951 edition of "Drilling and Production Practice" at $5 per copy, postpaid within the United States. This cloth-bound volume contains 30 papers (400 pages) specially selected from those presented at district and annual API meetings during 1951, and a bibliography of all papers presented at district meetings.

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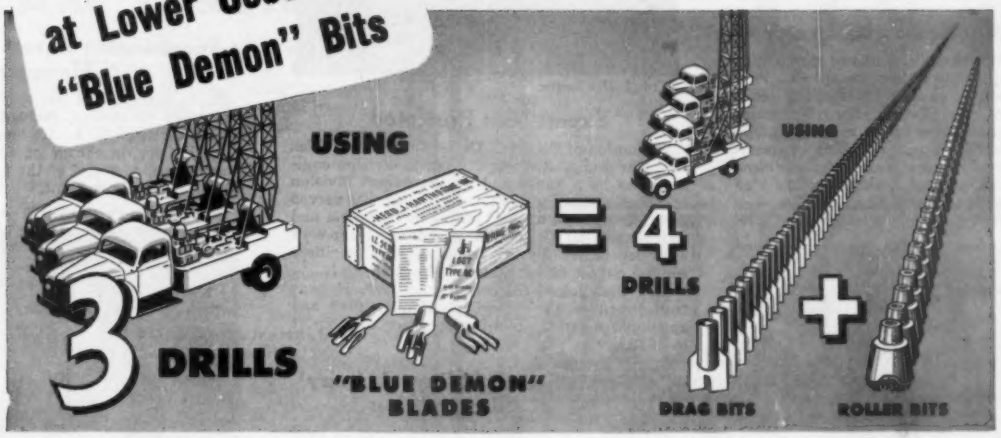

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They didn't wait to use up their stock of ordinary bits. They knew, after their own tests, that it would be far more economical to switch immediately to "Blue Demons" for their shot hole drilling . . . and get extra footage at lower cost.

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Forms Supply Division

I. W. McKinney has been appointed manager of the newly formed C-R-C Supply Division, A. S. Crutcher, president of Crutcher-Rolfs-Cummings, Inc., Houston, has announced. Before joining C-R-C, Mr. McKinney was in the valve division of Cameron Iron Works, Inc. He was formerly a Humble engineer. The new division will carry a complete line of pumps, valves, fittings, and hand tools.

Worthington Research Director

Ralph M. Watson has been named director of research for Worthington Corp. to succeed Paul Diserens who retired on July 1 after 43 years with the company. Mr. Watson joined Worthington in 1936 as an engineer in the refinery pumps section of the centrifugal pump division in Harrison, N. J. In 1942 he was made chief engineer of that division and in 1945 assistant to the vice president in charge of engineering.

R. M. Watson

C. B. Carter

R. C. Allan

Export Men Promoted

Promotion of Calvin B. Carter to assistant sales manager and of R. Carson Allan to division engineer has been announced by the export division of The National Supply Co. Mr. Carter has served in the company's oil field stores in Louisiana and the Texas Gulf Coast and as drilling equipment engineer before he was made division engineer for the export division in New York in 1947.

Mr. Allan joined the company in 1938. He was transferred to the export division in 1947 and appointed assistant division engineer for export in 1948.

California Standard Buys Refinery Site

Purchase of approximately 2,000 acres of land in Snohomish County, Washington as a possible site for construction of a refinery some time in the future is announced by Standard Oil Co. of California. The land is southwest of Paine Field, 20 miles north of Seattle. Purchase price was approximately $900,000.

"The way the Pacific Northwest is growing," the company said, "indicates to us that sooner or later it may be desirable to build a refinery there. We don't know whether this will be two years or ten years, but we want to be prepared when the time comes."

Drilling Rig Model

A scale working model of a drilling rig for exhibit purposes is offered by the Oil Industry Information Committee. The model is 30 inches high but weighs less than 15 pounds. It is suited for display in schools, public or business building lobbies, at events such as fairs and in offices. It is priced at $118 plus shipping costs, and may be ordered through the Oil Industry Information Committee, 50 West 50th Street, New York 20, N. Y.

Worthington Names Advertising Manager

M. E. Ziegenhagen has been named advertising and sales promotion manager of Worthington Corp., Harrison, N. J. He has been with General Electric Corp. in charge of advertising and sales promotion for several of the product departments of the Schenectady plant.

M. E. Ziegenhagen

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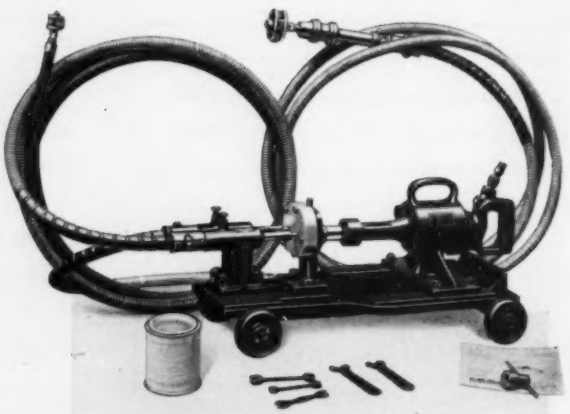

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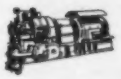
BROTHERHOOD

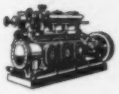
GENERATING SETS



Turbine driven up to 11,000 KW.
Engine driven up to 340 KW.

BROTHERHOOD

REFRIGERATING PLANT



Ammonia, CO_2, Freon, SO_2.
Wide range—single and double acting—one or more stages.

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STEAM ENGINES

High speed Vertical
up to 500 B.H.P.

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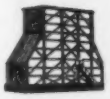
COOLING TOWERS



All types.
Nearly 50 years' experience.

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also Manufacturers of all kinds of

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Why not send your problems to us? We shall be pleased to investigate them confidentially without commitments.

HURST NELSON TANK CARS

We design and build Tank Cars to meet variations in the factors of volatility, viscosity and all other properties of the liquids to be transported; we fit them also to suit all types of terminal loading and discharging facilities at installations. Our service can meet your precise requirements.

We invite your Enquiries

HURST, NELSON & Co LTD

MOTHERWELL, SCOTLAND.

M. P. Venema

J. C. Raaen

R. E. Sutherland

M. D. Gilchrist

UOP Executive Appointment

David W. Harris, president of Universal Oil Products Co., Chicago, has announced major executive changes within the organization.

M. P. Venema, formerly a vice president, has been elected executive vice president. M. D. Gilchrist was elected a vice president with responsibility for sales. Col. J. C. Raaen was elected a vice president in charge of Universal's research and development laboratories, remaining as general manager. R. E. Sutherland was elected a vice president with responsibility for all engineering functions.

Edwin F. Nelson, formerly a vice president in charge of engineering, has resigned to enter business in Superior, Wisconsin. Mr. Nelson will continue his association with Universal in a consulting capacity.

Oil Well Supply Promotions

Melvin F. Jones has been promoted to manager of the Gulf Coast area of U. S. Steel's Oil Well Supply Division, Houston. He succeeds F. D. Smith who has been transferred to Dallas as assistant to the general manager of sales.

Mowing Machine for Trees

The Bushwacker, "a mowing machine for trees" that clears land at tractor speeds through dense undergrowth and wooded areas has been developed by the International Harvester Export Co. Built by the American Steel Dredge Co., Inc., Fort Wayne, Indiana, the machine weighs 14 tons, is mounted on an International model TD-9 diesel crawler tractor and powered by a 168 hp diesel engine. It is 11 feet wide, 21½ feet long overall, and clears a swath six feet wide at speeds from one and one-half to five miles per hour.

In one pass over a densely wooded area, trees up to eight inches in diameter and all undergrowth are reduced to small fragments and deposited upon the ground. The operating principle of the Bushwacker is relatively simple: 19½-lb. chrome manganese steel "flails" are attached by chains to a revolving steel drum mounted on a shaft at the front of the machine and partially enclosed within a heavy steel housing. The drum is powered by the 168 hp diesel engine and revolves at 1,050 rpm. The 20 flails travelling at about 11,500 fpm strike the growth with such force that the fibers are shredded. The trees or bushes are reduced to small fragments through further contact with the flails.

Approve Texas-California Crude Line

Approval has been given by the Petroleum Administration for Defense of the project of the West Coast Pipe Line Co. of Dallas, Texas for a crude oil pipeline from Wink, Texas to Norwalk, Calif.

As projected, the line will be of 24-inch diameter, will be aproximately 950 miles in length, and will have a daily capacity of 100,000 barrels. L. M. Glasco of Dallas is president of the company.

Construction is scheduled to begin in the fourth quarter of this year, and PAD has authorized purchase of 59,000 tons of pipe in the quarter which is equivalent to 275 miles of the project.

Arrangements for purchase of line pipe have been completed with Consolidated Western Steel Co. and Kaiser Steel Co., together with A. O. Smith. Financing of the line is being arranged through White Weld & Co., together with Union Securities Corp. of New York, acting on a full report on the project from Ebasco Services, Inc.

Rubber Catalog

Goodyear Tire & Rubber Co. has published a new catalog "Rubber Products for the Oil Producer and the Oil Refinery." Hose of all types, belts and packing are listed and described in detail. Inquiries for the catalog should be directed to: Goodyear, Akron, Ohio, asking for Code No. S-5111.

Refrigeration Compressor Booklet

Worthington Corp., Harrison, N. J., has published a new bulletin C-1100-B38 dealing with ammonia refrigeration compressors. Specifications, pictures and descriptions of various compressors and auxiliary equipment are shown. Copies are available on letterhead request.

POWER

SLOW SPEED OIL ENGINES 1000 to 3000 H P

CROSSLEY-PREMIER

ENGINES LTD.

SANDIACRE • NOTTINGHAM • ENGLAND

Water or Land...
RIGHT IN OUR STRIDE
MARINE
EXPLORATION CO.

At its annual supervisory conference held recently in Dallas, Geophysical Service Inc. brought together forty supervisors, division managers, and management personnel representing the various areas of GSI's operations. Twenty-one papers were presented in the two-day session with a round-table discussion following each paper. Dr. E. E. Rosaire was guest speaker and presented "Seismic Velocity Anomalies."

New Housing for Sun's Marine Dept.

Work has been started on a new office and service building for Sun Oil Company's marine department located in the Marcus Hook area overlooking the Delaware River. The two-story building will be nautical in character with an enclosed bridge atop a center tower and a deck on the roof. One section will provide space for the marine department administrative and operating staffs, while another section will contain facilities for the relief crews of Sun tankships and the shore gangs.

Joins Bethlehem Supply

James R. Rapier has joined Bethlehem Supply Co. as engineering representative with headquarters in Tulsa. He has had 16 years' experience in the compressor and pipe line pump field, and will continue his endeavors along similar lines throughout the Mid-Continent area.

Survey of Fatty Oils

"Properties Of The Principal Fats, Fatty Oils, Waxes, Fatty Acids and Their Salts," by M. P. Doss; The Texas Company, 135 E. 42nd St., N. Y., N. Y.; 244 pages; 8½ x 11 (horizontal); price, $5.00.

M. P. Doss, technical librarian of The Texas Co. for the past 26 years, has written an authoritative survey of the properties of the principal fats, fatty oils, waxes, fatty acids and their salts. The book is the result of 10 years' research involving the compilation of 1,350 references. In its 244 pages the properties of approximately 50 of the principal fats, fatty oils, and waxes are covered. Mr. Doss surveys only aliphatic acids, but he tabulates the properties of more than 800 of these.

The unique part of the book is the data given on the salts of the fatty acids ranging from aluminum through zirconium. Approximately 1,750 salts are listed. This material has never previously been brought together and it includes considerable unpublished data.

Employee Training Book

The techniques of training marketing personnel, and the profitable results that can be obtained from such a program, are spelled out in a new handbook issued by the Division of Marketing of the American Petroleum Institute. Just off the press, the handbook is now available through the Institute's headquarters in New York, 50 West 50th St. It is entitled "Developing Your Men Builds Profits," and is listed as API manual 1500. It is priced at $1 per copy.

Appointment of W. J. Carroll

William J. Carroll has been appointed treasurer of California Texas Oil Co., Ltd. and the Bahrein Petroleum Co., Ltd. Mr. Carroll joined Caltex as a stenographer in 1941 and received his B.S. in 1946 from Fordham University, School of Business, Evening Division.

W. J. Carroll

WEIR

The foremost name in

BOILER FEED PUMPS

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POWER PLANT AUXILIARIES

for more than sixty years

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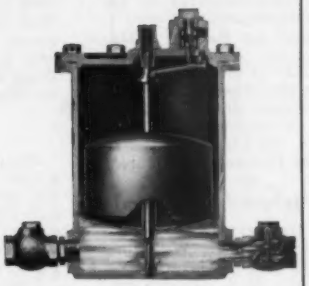
G. & J. WEIR LTD.
CATHCART : GLASGOW

Lifting oils and liquids with this AUTOMATIC PUMP



This automatic pump combines the good qualities of a pressure pump and a vacuum trap. Pumps hot condensate from low-pressure or vacuum vessels and lifts up to fifty feet or more; pumps boiling, cold or gaseous fluids (including oils); pumps petrol, benzine, dye liquors and alkaline liquors such as caustic, ammonia, etc.; drains sump holes, pits, excavations (where it may be fully submerged). Stops when there is no more liquid to pump; restarts automatically when liquid again flows into it. *Details of the 'Ogden' Pump (in five sizes) from:* SPIRAX MANUFACTURING CO. LTD., (Petroleum Dept.) Charlton House, Cheltenham, Eng.

NEW

REFINERY ERECTION CRANES FOR RENT

4	3000-B MANITOWOC 50-TON CRANES, 120 FT. JIB
2	3500 MANITOWOC 60-TON CRANES, 120 FT. JIB
1	3900 MANITOWOC 65-TON CRANE, 130 FT. JIB
1	1201 LIMA 75-TON CRANE, 170 FT. JIB

LEE CONSTRUCTION COMPANY

P. O. BOX 253, HOUSTON, TEXAS

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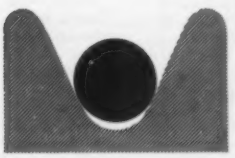
IF ROPE COULD TALK . . .

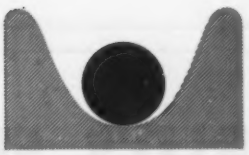
"Stop pinching me, you pulley!"

You can't punish ropes **and** expect to get the best out of them. So watch your PULLEYS and SHEAVES.

The radius of the groove of a pulley should always be slightly larger than that of the rope passing over it. If the groove is too narrow, it will crush the rope and soon damage the wires.



WRONG
Pulley groove too narrow.



WRONG
Pulley groove too wide.

RIGHT
Pulley groove correct—supporting the rope for 1/3rd. of its circumference.

If too wide, the rope not only wears more quickly at the point of contact but also cuts a false groove in the pulley.

With sheaves, oil the bearings at frequent intervals and check that they rotate freely. A seized up sheave can ruin a rope very quickly. Watch alignment too; see that sheaves, drums and pulleys are set exactly in line with the rope that is working over them.

Write for a copy of a new booklet "If Rope could Talk."

Pin up this announcement where your staff can see it. *It is issued in the interests of longer rope life by*

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Los Angeles Nomads Entertain Guests

International guests and speakers at the June meeting of the Los Angeles chapter of Nomads are left to right, back row: R. E. de Mestre of Bahrein Petroleum Co.; W. H. Clisby of Iraq Petroleum Co.; Fred Edmonds of Bethlehem Pacific Steel; Chas. McKeand of M. & M. Association of Calif. Front row: Lionel W. Wiedey of Standard Oil of N. J., formerly in Colombia; B. Clyde Enyart of Aramco, from Saudi Arabia; George Emerick of Burmah Oil Co.; M. T. Shawky of Anglo-Egyptian Oil Fields; and Albert J. Dodini of Bahrein Petroleum Co.

Joy Names Sales Manager

William L. Wearly has been appointed vice president of Joy Manufacturing Co. in charge of all domestic sales including Canada and Mexico. Mr. Wearly joined the engineering department of Joy in 1937 and has served successively as service manager and vice president in charge of coal machinery sales.

Lane-Wells Expands Service

Lane-Wells Co., in order to give a more concentrated coverage in major oil fields, has increased its number of locations by 15, making a total of 66 points in the United States from which customers can obtain prompt service. The recently added locations are in the Gulf Coast, Mid-Continent, and Pacific Coast divisions.

Southern Geophysical Advancements

Dr. Sidon Harris, president of Southern Geophysical Co., has announced that expansion of the company's operations has led to the advancement of three district representatives to the supervisory staff of the company.

G. D. Larson, supervisor for Kansas, is stationed in Great Bend, Kan. John N. Botkin, who recently returned after 14 months in Korea where he was a major in the Corps of Engineers, is being advanced to assistant supervisor, based in Billings, Mont. W. W. Deaver, who joined Southern four years ago, has been promoted to assistant supervisor in the Florida-Alabama area.

Schlumberger Transfers Announced

H. C. Brand has been transferred from assistant area manager for Schlumberger Well Surveying Corp. at Tulsa to North Central Texas division manager at Dallas. M. L. Millican has been transferred from Kermit, Texas, to Midland, where he is district manager. He is succeeded there by J. W. Little.

J. L. Heath leaves his position as district manager at Kennedy, Texas, to take the same position at Wichita Falls. His former post is filled by J. B. Markolf who moves from Columbus, Texas, where he opened the new Columbus district. Lee Petty has been made district manager at Columbus replacing Mr. Markolf.

J. C. West has been transferred from Tyler, Texas, where he has been field engineer, to the management of the district office at Magnolia, Ark. C. F. Schwab takes over the duties of resident engineer at the Mt. Pleasant, Mich., station.

Moving to the headquarters staff at Houston are R. P. Alger and J. S. Kellough. Mr. Alger comes from Magnolia, Ark., where he has been stationed as district manager since 1942, to join the operations department in Houston as assistant to the chief field development engineer.

L. A. Allaud, recently returned from a 4-year period of service with Schlumberger Surenco, S.A. in Venezuela, has been made assistant area manager of the newly created Northwest Texas area under the direction of J. A. Bodin. Mr. Allaud joined Societe de Prospection Electrique in 1935, working in Pechelbronn, France. In 1936 he was transferred to the Schlumberger Well Surveying Corp. and came to the United States. He served as district manager in Louisiana, Texas, Kansas, and Illinois before going to South America in 1948 where he was division manager at El Tigre in Eastern Venezuela.

New Fire Truck

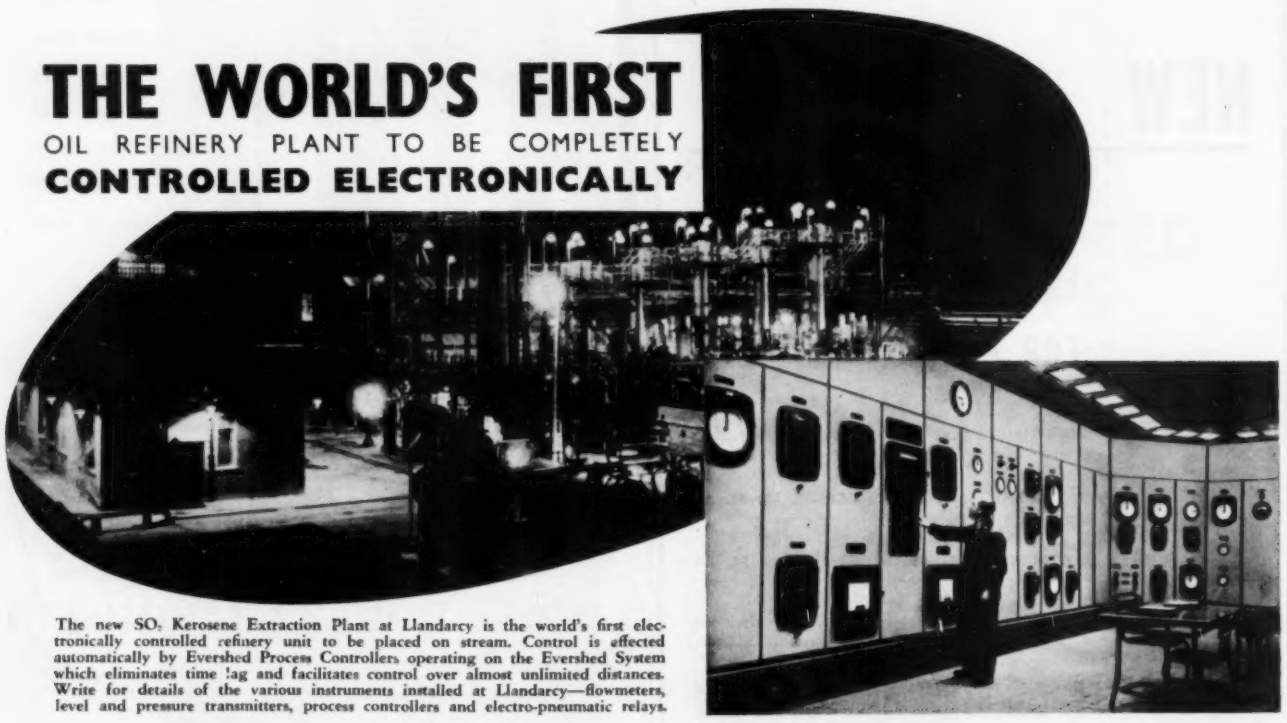
Socony-Vacuum Oil Co. recently has outfitted a new fire truck for its Olean, N. Y., refinery. The truck is an International L-192 with 193-inch wheelbase, dual rear wheels and 372 cu. in. engine. Width is 90 inches. The truck carries a crew of five men when called to a fire and has a gross weight of about 21,000 pounds.

Foam pumping equipment is a two stage centrifugal pump operated from the driveshaft which is capable of discharging 6,000 gpm at 150 psi. Portable aluminum foam towers 38½ feet in height are carried, giving protection to tanks up to 35 feet in height. Foam solution tank has a capacity of 500 gallons. Two proportioners regulate solution flow over a wide range. Nozzles are instantly adjustable to regulate type of foam discharge. Equipment for the truck was designed by National Foam systems.

THE WORLD'S FIRST

OIL REFINERY PLANT TO BE COMPLETELY

CONTROLLED ELECTRONICALLY



The new SO_2 Kerosene Extraction Plant at Llandarcy is the world's first electronically controlled refinery unit to be placed on stream. Control is effected automatically by Evershed Process Controllers operating on the Evershed System which eliminates time lag and facilitates control over almost unlimited distances. Write for details of the various instruments installed at Llandarcy—flowmeters, level and pressure transmitters, process controllers and electro-pneumatic relays.

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ASK FOR SET OF CATALOGUES, WP.52

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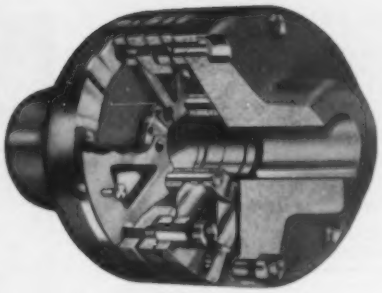
A UNIQUE COUPLING WHICH IS TRULY

The most revolutionary development in coupling design seen in recent years. Axial and angular flexibility maintained under conditions of extreme misalignment and full load. No backlash—No lubrication—No working parts.



METASTREAM PATENTED ALL METAL *flexible* COUPLINGS

An all metal coupling which permits angular misalignment and adequate axial movement between driving and driven units. There are no sliding or rolling members, no springs, gears, chains or rubber mountings. The extreme measure of flexibility provided is achieved **without the need of any form of lubrication whatsoever.**

The Metastream Spacer Coupling, shown below comprises two Metastream couplings and a central spacer, built into one unit. The design permits a measure of angular and lateral misalignment, and provides maximum accessibility of the driven machine by removal of the spacer.

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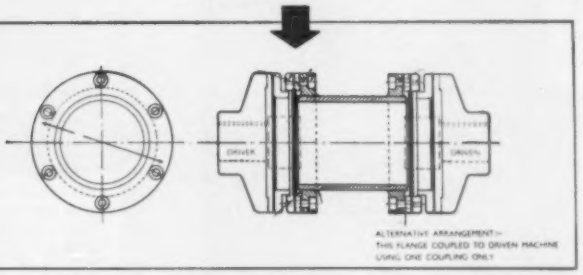
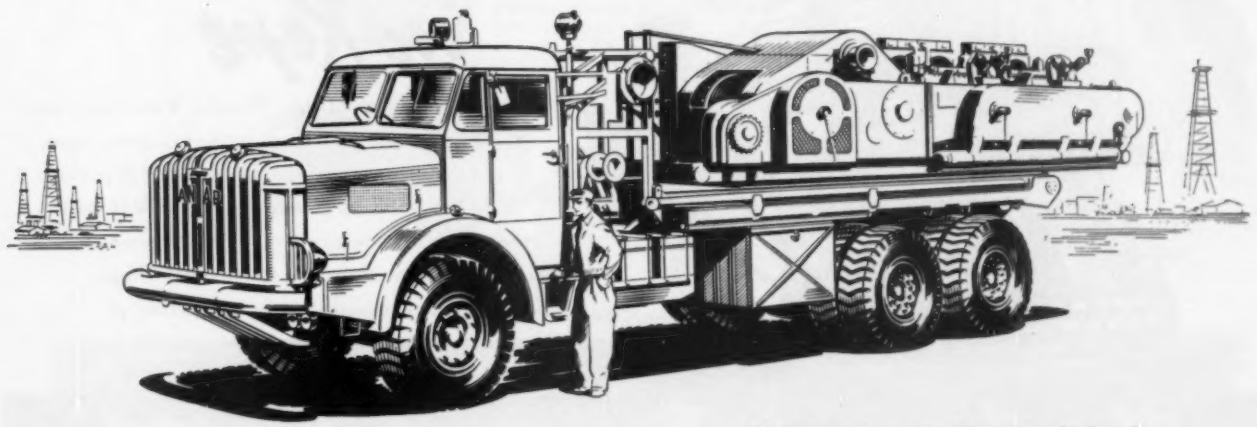


THORNYCROFT

SPECIALIST SUPPLIERS OF WHEELED TRANSPORT TO THE OIL INDUSTRY



"Mighty Antar" 25 ton self loading oilfield truck. One of several shipped to Sarawak and Venezuela for Shell.

JOHN I. THORNYCROFT & CO., LIMITED, THORNYCROFT HOUSE, SMITH SQUARE, LONDON S.W.1., ENGLAND.

New Motor Oil

The Tide Water Associated Oil Co. has produced a new high detergency motor oil and is embarking on a nationwide promotional campaign. The new product is branded "Veedol High Detergency Motor Oil." The company reports that it is a Pennsylvania crude product that employs new types of additives.

Fluor Promotes Jack McKay

Jack McKay has been appointed manager of the sales promotion department of The Fluor Corp., Ltd., Los Angeles. He will be in charge of advertising, publicity, exhibits and all phases of sales promotion.

Mr. McKay joined Fluor in 1942 and for the past eight years has been directly connected with sales, serving as sales engineer, assistant to the director of sales, and assistant district sales manager of Fluor's Houston district sales office for the past 2½ years.

J. McKay

Goertz Receives Axelson Award

Seventy-five years of service is the combined record of J. C. Axelson, president and general manager of the company, and Bill Goertz, California sales manager of Axelson's petroleum equipment division shown receiving 25-year service award. Mr. Goertz is the 73rd man to receive the diamond service pin. This is J. C. Axelson's 51st year of active association with the company.

New Lane Wells Assignments

Expanding operations in two divisions have resulted in sales engineer assignments for five Lane-Wells men. Those effected are O. T. Bright, Leonard F. Crilton, and John S. Hatcher in the Mid-Continent division and Tom Caton and Charles Viverette in the Gulf Coast division. Mr. Bright will be a district sales engineer at Mt. Carmel, Ill.; Mr. Chilton at Cody, Wyo.; Mr. Hatcher at Guymon, Okla.; Mr. Caton at Beaumont, Texas; and Mr. Viverette at Odessa, Texas.

"Payload" Tractor

A new "Payload" tractor has just been announced by The White Motor Co. This tractor has a new weight-saving design and 102-inch dimension from bumper to back of cab. The tractor was designed to improve performance under heavy loads, tight schedules and hilly road conditions, and maximum payload.

Laird Joins Crane Co.

Hubert C. Laird, until recently vice president of Otis Engineering Corp., joined Crane Co. on July 1 as field engineer to expand the company's services to the petroleum industry. He will concentrate on the valve and fitting problems of petroleum production.

In 16 years with Otis Engineering and Otis Pressure Control, Inc., Mr. Laird worked as a field engineer, design engineer, and chief engineer before being named vice president in charge of manufacturing at Dallas. He will work from the engineering division headquarters at the large Crane Co. Chicago plant.

H. C. Laird

FOR OVER TWO HUNDRED YEARS

They have relied on Rope

Since the days of the "Wooden Walls" men who "Know the Ropes" have specified Gourock ropes, and to-day, as in the past, the Gourock Ropes are to be found on all Seven Seas. The skill and ropemaking "know-how" of over 200 years is spun into every strand of a Gourock Rope, experience that is devoted to the production of the finest ropes made to-day. Write now for specifications, prices and Catalogue No. O. I.

The Gourock Ropework Co., Ltd.

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In the past few years 25 new companies have entered the seismograph survey business employing the finest seismic equipment built—that built by Century Geophysical Corporation. These companies are now operating over 85 sets of Century Recording Instruments throughout the United States and Canada. They are offering accurate records to the oil industry upon which are based the petroleum reserve discoveries of tomorrow. For your seismic instrument needs... look to the industry's leader... look to Century.

REGISTER and VOTE — it's YOUR country

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CENTURY GEOPHYSICAL CORPORATION OF CANADA, 223 Examiner Bldg., Calgary, Alta., Canada

309 Browder St.
Dallas, Texas

Export Office
149 Broadway, N. Y. City

Walter A. Schulze

Walter A. Schulze, 52, a member of the research planning board of Phillips Petroleum Co., died July 30 following a short illness. Mr. Schulze was a widely-known scientist in the oil industry. He joined Phillips in 1929, and from 1945 to 1950 was assistant director of the chemicals division in the research and development department.

R. C. Gwilliam

R. C. Gwilliam, 60, vice president and manager of the Houston, Texas, division of The Ohio Oil Company, died at his home in Houston Tuesday evening, July 15, following a heart attack.

Mr. Gwilliam joined The Ohio Oil Co. in 1930 as attorney in the Casper, Wyoming, division office. He was elected a vice president of the Company and appointed Houston manager in 1937.

A. E. Blakely

A. E. Blakely, former chief of the labor department of the Compania Mexicana de Petroleo El Aguila (Shell), died in Central Medica of Mexico City on May 20 and was buried in the local French cemetery. Mr. Blakely, a prominent member of Mexico City's Anglo-American colony, is survived by his widow, a son, two sisters and several nieces and nephews.

Theodore Bockman

Theodore Bockman, a chemical engineer with Universal Oil Products Co. for nearly 18 years, died July 30 in Chicago.

Mr. Bockman was a brother of George A. Bockman, treasurer of Universal. He recently spent several months in England on a special engineering assignment.

SAVES MONEY TIME WORK

Here in this self-contained Drum Rinser, petroleum bulk plants, chemical terminals, and all industries using drums cleaned by petroleum-based solvents, will find a new, fast and practical drum-cleaning method which eliminates the need for returning drums to the refinery or cleaning plant before every refill.

Every square inch inside the drum is scoured, with the solvent being forced into the drum and removed in one *simultaneous operation*. Sand and similar larger particles of solid matter are flushed loose under 35 pounds liquid pressure and instantly removed from the drum without draining. No installation . . . no piping . . . no air lines . . . just one electrical connection.

WRITE NOW FOR FULL INFORMATION

Gilbarco

Gilbert & Barker Mfg. Co. West Springfield, Mass., Toronto, Canada

Sheldon Clark

Sheldon Clark, chairman of the Sinclair Oil Corp., died August 15 after a long illness. He would have been 76 years old on August 26.

Mr. Clark had been a Sinclair director since 1925. He was one of the pioneers of the company and one of those largely responsible for building the Sinclair organization to its present rank of eighth among oil companies in total assets and 16th among U. S. industrial companies.

He first joined the company when the Cudahy Refining Co. was acquired in 1916 and the name changed to Sinclair Refining Co. Joseph M. Cudahy was elected president.

Mr. Clark served on the Petroleum Industry Board in the first World War and was active in obtaining necessary petroleum supplies for the United States and its allies. In 1919 he surveyed South America to determine the petroleum producing and marketing possibilities of that area and represented Sinclair in many of the negotiations by which the company extended its operations.

He was internationally known in yachting circles, was Commodore of the Yachtsmen's Association of America, one of the founders and Commodore for several terms of the Chicago Yacht Club, and held life membership No. 1 in that organization.

Ralph W. Gallagher

Ralph W. Gallagher, former president and chairman of Standard Oil Co. (N.J.), died July 31 at his home, 1040 Park Avenue, New York, after a prolonged illness. He was 71 years old. Mr. Gallagher retired in December, 1945 after 48 years with the Jersey Standard organization.

Mr. Gallagher began work in an Olean, N. Y., pumping station at the age of 16. In 1900 he joined the East Ohio Gas Co. which was then building natural gas pipe lines from West Virginia. Six years later he was given charge of East Ohio's trunk pipe line construction and in two years moved to its general offices in Cleveland to supervise all its properties. He became president of the company in 1926.

In 1933, Mr. Gallagher came to New York to become a director of the parent company. He was elected chairman in November, 1942 and less than a week later, when W. S. Farish died unexpectedly, was elected president.

After his retirement from Jersey Standard in 1945, Mr. Gallagher served as a director of W. T. Grant Co. and J. P. Morgan and Co.

George W. Evans

George W. Evans, a 30-year employee of Continental Oil Co., died of a heart attack on July 28th at his home in Fort Worth, Texas. He had been a member of the Continental staff since 1922. He became coordinator of pipe lines and manager of purchasing in 1949. Early this year Mr. Evans was promoted to assistant regional general manager of Continental's newly created southwestern region, and established his headquarters in Fort Worth.

The Oilman—A Pictorial Study

An unusual and attractive contribution to the literature of the petroleum industry is "The Oilman," a collection of some 200 photographs by Thomas Hollyman. Reproductions of these photographs, with brief explanatory cut lines, portray the successive operations in the finding, transportation, processing and marketing of petroleum from the exploratory work of the field geologist to the man at the roadside station who services the motorist's car.

The careful selection of subjects for camera treatment and the wide range in types of industry personnel caught by Mr. Hollyman in the 4,000 mile trip which provided the material for the volume give the work a vivid quality that could not be matched by any written description. It brings home the actualities of the industry in most effective fashion.

The Oilman; Rinehart & Company, Inc., New York and Toronto. $1.50.

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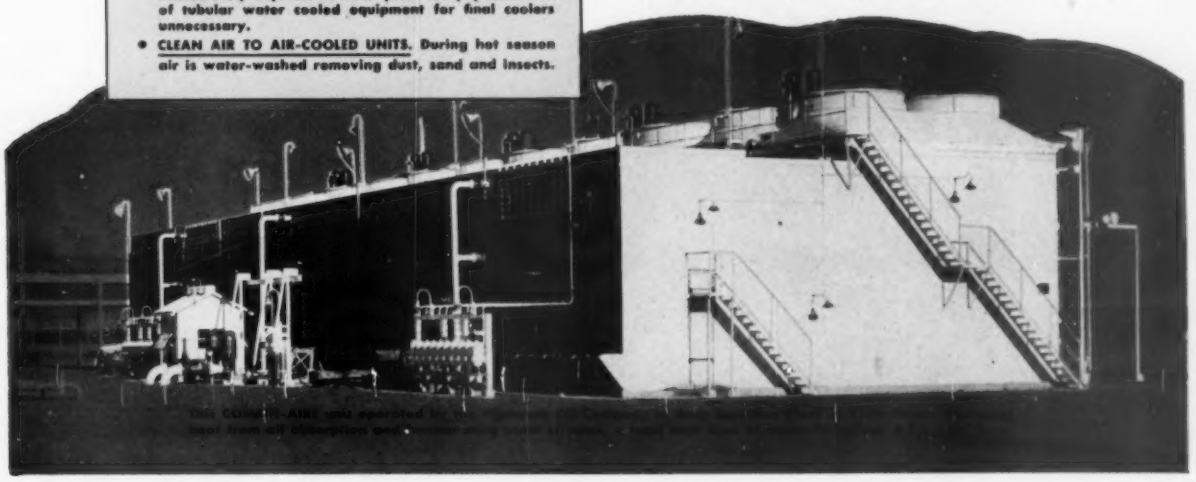

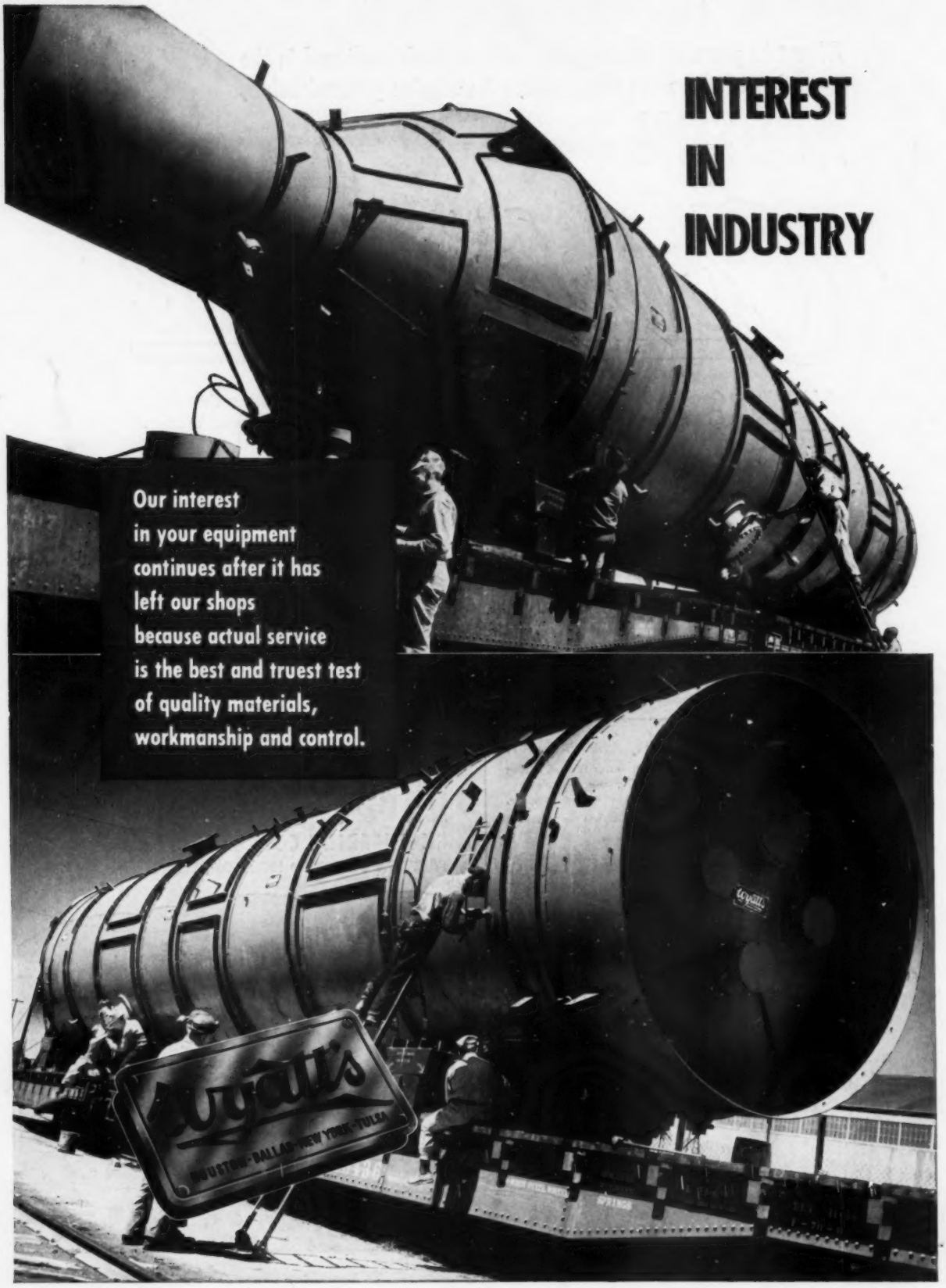
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